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FloodPlain Management Assessment

June 1995

Appendix C (Environmental Resources Inventory)



US Army Corps
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FIELD	GROUP	SUB-GROUP															
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The purpose of this report is to provide an inventory of the environmental resources within the floodplains of the upper Mississippi and lower Missouri Rivers and selected tributaries. The study area has been divided by river reaches. The main objectives of the inventory are: establish a 1993 base-line condition of the floodplains by characterizing associated environmental resources including soils, vegetation, wetlands, lakes, fish and wildlife, endangered species, important habitats, unique ecosystems and plant communities; describe the effects of the 1993 flood and provide a foundation for projecting the effects and implications of alternative floodplain management policies on these resources.																	
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**Environmental Resource Inventory
for the
Upper Mississippi River,
Lower Missouri River
and
Major Tributaries**

**for the
U.S. Army Corps of Engineers**

May, 1995

**DACW 41-94-D-9002
94-800-4-003**

**by
Burns & McDonnell
Engineers-Architects-Consultants
Kansas City, Missouri**

i. Purpose

The purpose of the Environmental Resource Inventory is to support the overall Floodplain Management Assessment, a regional analysis of the Upper Mississippi and Lower Missouri River Basins. As such, the information is only at the level of detail necessary to provide an overview of the environmental resources within the floodplain, which is commensurate with the scope and level of detail of the other components of the Floodplain Management Assessment. The main objectives of the Environmental Resource Inventory are listed below.

1. Establish a 1993 base-line condition of the floodplains of the upper Mississippi and lower Missouri Rivers and selected tributaries by characterizing associated environmental resources. Resources addressed include soils, vegetation, wetlands, lakes, major tributaries, fish and wildlife, endangered species, important habitats, unique ecosystems and plant communities, fish and wildlife refuges, natural areas, and Federal and state recreation areas.
2. Describe the effects of the 1993 flooding on the inventoried resources.
3. Provide a foundation for projecting the effects and implications of alternative floodplain management policies on these resources.

ii. Authority

The Environmental Resource Inventory was prepared as an integral component of the Floodplain Management Assessment directed by the Fiscal Year 1994 Energy and Water Development Appropriations Conference Report, House Resolution (H.R.) 2445, which was signed by the President on October 28, 1993. The assessment was jointly sponsored by Docket 2423, Committee on Public Works and Transportation, U.S. House of Representatives, "Upper Mississippi and Lower Missouri Rivers and their tributaries" which was adopted November 3, 1993.

H.R. 2445 directed "the Corps of Engineers to conduct studies of the upper Mississippi and lower Missouri Rivers and their tributaries that were flooded in 1993." Furthermore, "The study should focus on identifying public facilities, industrial, petrochemical, hazardous waste, and other facilities which required additional flood protection, assess the adequacy of current flood control measures, examine the differences on Federal cost-sharing for construction and maintenance of flood control projects on the upper and lower Mississippi River system, evaluate the cost-effectiveness of alternative flood control projects, and recommend improvements to the current flood control system."

Docket 2423 directed the Secretary of the Army to "conduct comprehensive, system-wide studies to evaluate flood control and flood plain management needs of the upper Mississippi and lower Missouri River(s) and their tributaries that were flooded in 1993."

This appendix is a compilation of working papers resulting from a combined effort between the five Corps of Engineer Districts involved in the Floodplain Management Assessment and a contractor. The data in these appendices were not as thoroughly reviewed to remove all inconsistencies or editorial errors as was accomplished for the main report. In some cases numbers may have been reconciled in the main report but not in the appendix.

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Environmental Resource Inventory

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Environmental Resource Inventory

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1.0 INTRODUCTION

1.0 INTRODUCTION

1.1 SCOPE

As stated in the preface, the purpose of this report is to provide an inventory of the environmental resources within the floodplains of the upper Mississippi and lower Missouri Rivers and selected tributaries. Figure 1-1 on the following page shows the states and rivers included in the study. Section 2.0 contains information on the Upper Mississippi River Basin. Section 3.0 contains information on the Lower Missouri River Basin.

The study area has been divided by river reaches. Reaches consist of either a segment of the Mississippi or Missouri Rivers or one of the tributaries. The boundary for tributaries stops at the edge of the floodplain of the river they join. Reaches vary in length from under 50 river miles to over 150 river miles. The reaches were defined by the U.S. Army Corps of Engineers Districts (USCOE) based on relatively uniform geomorphology, environmental resources and other characteristics. The descriptions of each river reach provide an overview of the resources contained therein and highlight significant features such as important habitat or recreation areas.

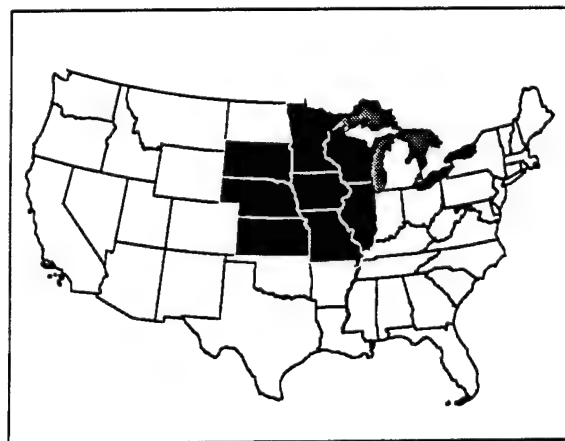
Information for this study was drawn from computer database files, available literature, and agency contacts. One of the major sources of information was digital data provided by the Scientific Assessment and Strategy Team (SAST). SAST was formed through a directive from the White House Office of Science and Technology Policy. Its purpose was to provide scientific assistance to Federal officials with regard to recovery and river basin management within the Upper Mississippi and Lower Missouri River Basins. The team consisted of specialists from resource agencies throughout the Federal agencies. The main product of the effort was an environmental information system which consists of an array of digital database files.

The SAST data were the basis for establishing the boundaries of the floodplain and quantifying resources such as soils, land use/land cover, and wetlands. The boundary for the floodplain was basically from "bluff to bluff." In addition, the study team contacted state and Federal resource agencies throughout the study area. Section 1.2, Resource Definitions, provides more information on the nature of the data employed in the study.

The study also addresses the effects of flooding to the extent possible. Many studies have been initiated on the effects of the flood of 1993, but limited results were available at the time of this report. The available information on flooding is summarized in Section 4.0. It contains a description of the general types of impacts which are typical of a major flood such as the flood of 1993, as well as some findings from the Environmental Management Technical Center regarding the 1993 flood.



■ Shaded area shows extent of floodplain



Key Map

120 0 120 240 Miles



Figure 1-1
Floodplain Management Assessment
Study Area

1.2 RESOURCE DEFINITIONS

The Environmental Resource Inventory (ERI) addresses a variety of environmental resources. Likewise, the data was drawn from many sources. The intent of the ERI is to characterize the resources present within the bluff-to-bluff floodplain before the 1993 flooding. The data collection was based almost entirely on secondary sources, including the SAST data files, Natural Heritage Inventory (NHI) data from each state, reports and maps.

The accuracy and method of collection vary from source to source. The use of different sources yields different results in some cases. For instance, some data were collected through satellite imagery and some were based on aerial photography or field sampling. In some cases the definitions for a resource differ between agencies. The differences in these databases means that the data are not necessarily comparable between sources. In particular, the amount of wetlands in the land use/land cover data do not correspond to the data from the National Wetland Inventory (NWI).

The location of some resources along the Mississippi and Missouri Rivers is identified by river mile (RM). River miles along the Mississippi River are measured upstream from the confluence with the Ohio River. River miles along the Missouri River are measured upstream from the confluence with the Mississippi River. The Illinois River is the only tributary that has river miles.

In the case of Fish and Wildlife Management Areas, Natural Areas, and Recreation Areas; the inventory includes the entire area if any part of it falls within the floodplain. Following are descriptions of the major resource categories addressed in the study as well as the major sources of information employed for each resource. A list of acronyms used in the text is provided at the back of the report.

1.2.1 Soils

Soils are an important element in determining the potential suitability of a site for agriculture, wildlife or construction. Because of the magnitude of the study, it was infeasible to employ individual county soil surveys. Therefore, the descriptions of soils in this ERI are based on soil associations. The data was derived from the State Soil Geographic Data Base (STATSGO) and state soils reports. STATSGO was developed by the U.S. Department of Agriculture, Soil Conservation Service (SCS). It consists of a computer map and database. The data was developed at a scale of 1:250,000. The soils reports were prepared by the state offices of the SCS. The STATSGO data provided a means to determine the area occupied by specific soil associations occurring within each river reach. The state reports provided descriptions of the soil associations. These descriptions are contained in Appendix A and B, for the Mississippi River Basin and Missouri River Basin respectively.

A soil association is a distinct combination of soil types. It normally consists of one or more major soils and at least one minor soil. Individual soil types may occur in more than one association, but in a different proportion or pattern. The limitation of this database is that soil associations are combinations of soils and therefore cannot be described in terms of specific qualities such as suitability as prime farmland or capability class. Such descriptions are only provided for the individual soil types, as part of the county soil surveys.

1.2.2 Land Use/Land Cover

Land use/land cover refers to the dominant use or features present in an area. The land use/land cover classification for this inventory was based on the U.S. Geological Survey (USGS) system developed by Anderson. The land use/land cover data was provided by the Scientific Assessment and Strategy Team (SAST). It was based on Landsat remote sensing data which is developed from satellite images having a resolution of 30 meters square. The following Anderson level 1 categories of land use/land cover under that system occur within the study area:

Urban Land: Areas of intensive human development, including cities, towns, subdivisions, and industrial areas.

Agricultural Land: Includes all types of land used for food and forage production such as cropland, pasture, orchards, and feed lots.

Rangeland: Lands where the natural vegetation is predominantly grasses, forbs, or shrubs and the traditional use is grazing.

Forest Land: Land areas that have a tree-crown (spread) covering 10 percent or more of the area. Where forest land overlaps urban land or wetlands, the land is classified in one of the latter categories. As a result, forested wetlands are identified only as wetlands within this data source.

Since most of the forest within the study area occurs in wetlands, this data source represents forest land in many cases. To compensate for this discrepancy, the acres of forested wetland from the NWI have been included in the land cover data. The acres of NWI forested wetland were subtracted from the total Landsat wetlands data, separating the category into forested wetlands and non-forested wetlands. The original Landsat forest data appeared to occur in small woodlots away from the rivers, therefore the category was renamed as upland forest. Limitations on the availability of NWI data are discussed under aquatic resources. Combining these data sources provides a representation of upland forest, forested wetlands, and non-forested wetlands.

Water: This category includes all bodies of water, such as rivers, streams, lakes, and ponds.

Wetlands: Areas where the soils are saturated, flooded or ponded for a significant part of most years, (hydric soils) and wetland vegetation is present. Open water and land that has been converted to agricultural use, but would otherwise meet the definition are not included. This data is not directly comparable to the NWI data compiled by the U.S. Fish and Wildlife Service (USFWS) whose data were developed from 1:24,000 scale aerial photography.

Barren Land: Land with little or no vegetative cover, including such features as quarries, strip mines, and beaches.

The discussion of land use and land cover also includes a description of the major vegetation types within each river reach and plants listed as threatened or endangered by the Federal or state agencies (species of special concern). Major vegetation types were identified through general literature. The

plant species of special concern were identified through a database search conducted by the Natural Heritage Inventory (NHI) in each state.

In some cases, the vegetation description is based on the ecological region. Ecological regions have been identified by the Environmental Protection Agency as areas having similar land form, potential natural vegetation, land use and soils.

1.2.3 Threatened and Endangered Species

The primary source of data on threatened and endangered species (species of special concern) was provided by the NHI programs in each state. The NHI staff performed a database search of the floodplains for each river in the study area. They provided information on the recorded occurrence of species by location. However, to protect the species the exact location can not be identified in the report.

An occurrence is a record of sighting by a recognized expert. The record of sighting may refer to seeing the species; seeing a nest site, roost site or colony; or collecting a specimen. Even though a species is classified as threatened or endangered it may be common enough in some areas that recording each siting would be too cumbersome. In these cases only a nest site, roost site, colony, or collected specimen would be recorded as an occurrence. For example, in areas where bald eagles are common, an occurrence would not be recorded for each siting but would be recorded only for the roost sites. For species that are unusual to a particular area, an occurrence would likely be recorded for any verified siting. Threatened and endangered species are listed under the subsections: Plant Species of Special Concern, Aquatic Species of Special Concern, and Wildlife Species of Special Concern.

1.2.4 Aquatic Resources

The discussion of aquatic resources in this study pertains to features that are adjacent to the rivers under review. The primary floodplain features are wetlands and lakes. Tributaries to the main rivers are noted as well since they are significant elements of the river system.

Wetlands and other aquatic resources are major contributors to fish and wildlife populations, sediment control, water purification, and flood control. In simple terms, wetlands are ecotones (transition zones) between open water and uplands. They do not include open water areas. They possess three essential characteristics: hydric (saturated) soils, vegetation adapted to such soils, and sufficiently wet conditions to maintain hydric soils and vegetation from SAST.

The wetlands data in this inventory were derived from NWI data developed by the USFWS. Digitized data files from SAST were provided to the study team. In particular, the data sets used were for the palustrine system of wetlands, which includes vegetated wetlands. Vegetated wetlands are divided into three classes based on the prevalent type of vegetation: emergent (herbaceous, e.g. smartweed, bulrush), shrub/scrub, and forested. When available, the area of each wetland class is provided for each river reach. NWI coverage ranged from 0 to 100 percent for a given segment. The files provided may not have contained all NWI data for the study area. When the coverage amounted to 60 percent or more, the data were extrapolated arithmetically to estimate 100 percent. If the coverage was less than 60 percent, the data were not used because it was not considered to

reliably represent the pattern of the entire reach. In these cases, the wetland figure from the land use/land cover data was used to provide an estimate of total wetland acreage.

The number and area of lakes and ponds was drawn from USGS Digital Line Graph files. Those files contain information on individual aquatic features, including the category lakes and ponds. They are based on 1:100,000 USGS maps. This data does not correspond to the water category in the land use/land cover tables.

1.2.5 Fisheries

The rivers support a wide variety of aquatic species. This inventory focuses on the species of most importance to the public for sporting and commercial value, as well as those species designated as threatened or endangered under the Endangered Species Act or by the states. The term fisheries is used in a broad sense to include both fish and mussels.

The discussion provides a review of the most common game fish species and species of commercial value. The locations of the most valuable aquatic habitats are identified in the discussion of Important Aquatic Habitat. Numbered pools refer to water bodies formed above the corresponding numbered locks and dams on the Mississippi River. The primary sources for this information were the state fish and wildlife management agencies and the USFWS.

After review of the draft ERI, there was concern that some threatened or endangered species known to occur in a reach had not been identified. The draft tables were then sent to each state fish and wildlife management agency for review. Some additional species were added to the tables based on comments from these agencies.

1.2.6 Wildlife

The rivers and adjacent floodplains are home to many forms of wildlife including mammals, waterfowl, birds, amphibians, and reptiles. The focus of the study is on the major species, such as game species and protected species. A description of important habitats for these species is also included. The primary sources for this information were the state fish and wildlife management agencies and the USFWS. Data on threatened and endangered species was provided by the Natural Heritage programs in each state, as described previously under fisheries.

1.2.7 Fish and Wildlife Management Areas

This section provides a listing and description of the existing fish and wildlife management areas which are either within or overlap the study area. These areas include state and Federal wildlife refuges, wildlife management areas, waterfowl production areas and state conservation lands. While some of these areas also provide recreational opportunities, their primary purpose is for wildlife management. Recreation is covered in a later section.

1.2.8 Natural Areas

These areas are typically unique examples of ecological and geologic features. They sometimes provide habitat for species of special concern. They are often used for recreation activities such as hiking and bird-watching. State and Federally-designated natural areas are listed and described in this section. Natural Features Inventories provided the main source of information on these areas.

1.2.9 Recreation Areas

This category includes land designated primarily for recreational use. It includes Federal, state and local parks, and public use areas. State and national forests have been included in this section because they also provide significant recreational opportunities. Data on recreation areas came from USCOE reports, state guides and local publications.

1.2.10 Data Gaps

This inventory is based on a wide array of information sources. Some of the data used are from existing sources such as NWI data files. Other data were assembled by the SAST or specifically for this inventory. All of these data sources do not cover the entire study area. This section identifies the types of information or areas where data were incomplete by river reach.

1.2.11 References Cited

The references cited in the text of each river reach are included in this section. The general background sources, such as the digital files, are listed in Section 5.0 Data Sources.

1.3 EFFECTS OF FLOODING

The ERI is not intended to document the extent of flooding, or provide an estimate of the economic damage caused by the 1993 flood. Rather, the intent is to identify the effects of the flooding on the environmental resources within the floodplain. While many studies are underway, few have been completed at this time. Section 4.0 contains some general findings on the effects of flooding as well as findings from the Environmental Management Technical Center in Onalaska, Wisconsin, and the Long-Term Resource Monitoring Program regarding the effect of the 1993 flood on the Mississippi River.

2.0 ENVIRONMENTAL RESOURCES UPPER MISSISSIPPI RIVER BASIN

2.0 ENVIRONMENTAL RESOURCES MISSISSIPPI RIVER BASIN

2.1 OVERVIEW

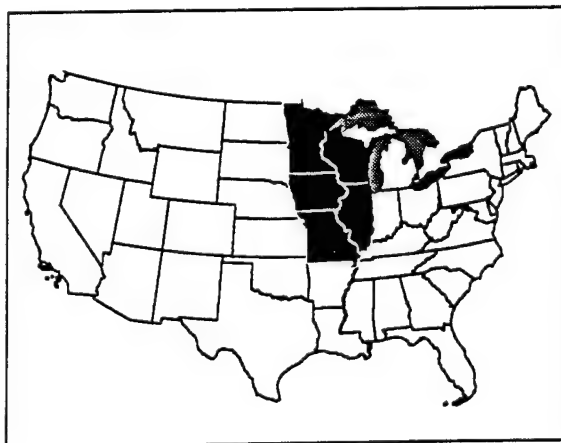
This section of the Environmental Resource Inventory (ERI) contains descriptions of the natural resources within the floodplain of the river reaches within the Mississippi River portion of the study area (see Figure 2-1). The descriptions are presented in sequence from the upper end of the study area in Minnesota down to the confluence with the Ohio River.

Each subsection contains a profile of the natural resources contained in a particular reach, as well as an inventory of the management areas in the reach. These areas include fish and wildlife management areas, natural areas, recreation areas, and forests.

The presentation begins with an explanation of what is included within each resource category and the primary source of data for that resource. Complete coverage is not available for all types of data. Therefore, the last item in the descriptions is a discussion of any data gaps and how they affected the presentation. Each section contains a list of the specific references cited for that reach. The general data sources used for the study are listed in Section 5.0, Data Sources.



■ Shaded area shows extent of floodplain



Key Map

120 0 120 240 Miles



Figure 2-1
Upper Mississippi River
Study Area

2.2 MINNESOTA RIVER: MANKATO TO HENDERSON, MINNESOTA

This study reach is the Minnesota River from near Mankato, Minnesota to near Henderson, Minnesota (see Figure 2-3). It covers four counties in the state of Minnesota and is approximately 25 river miles in length. Mankato, Minnesota, is the major community located along this study reach. The Minnesota River from Mankato to Henderson can be characterized as a flat wide river draining primarily agricultural areas and carrying heavy silt-loads.

2.2.1 Soils

The soil associations that occur within this reach, as well as the acreage of each association are listed in Table 2.2-1. Descriptions of the state soil associations are provided in Appendix A. Occurrence refers to the number of times the soil association was formed within the reach.

Table 2.2-1

SOIL ASSOCIATIONS MINNESOTA RIVER: MANKATO - HENDERSON

Soil Association	State	Occurrences	Acres	Percent
CHASKA-MINNEISKA-COLO	MN	1	5,840	26
LESTER-HAWICK-TERRIL	MN	7	1,490	7
LESTER-LESUEUR-CORDOVA	MN	1	60	<1
COPASTON-CHASKA-MINNEISKA	MN	2	13,760	61
DICKMAN-SPARTA-ESTHERVILLE	MN	1	250	1
COLAND-CLARION-SHOREWOOD	MN	2	1,050	5
SOIL ASSOCIATIONS SUB TOTAL	--	14	22,450	100
UNCLASSIFIED AQUATIC	MN	--	0	--
SOILS AND AQUATIC TOTAL	--	--	22,450	--

2.2.2 Land Use/Land Cover

2.2.2.1 Land Use

The total area of floodplain within this reach is 22,450 acres (see Table 2.2-2). Mankato, at the southern end of the reach, is the dominant urban area. St. Peter and LeSueur are smaller communities. A railroad line runs along the right descending bank of the river, a highway is located on the left descending bank along the majority of the reach.

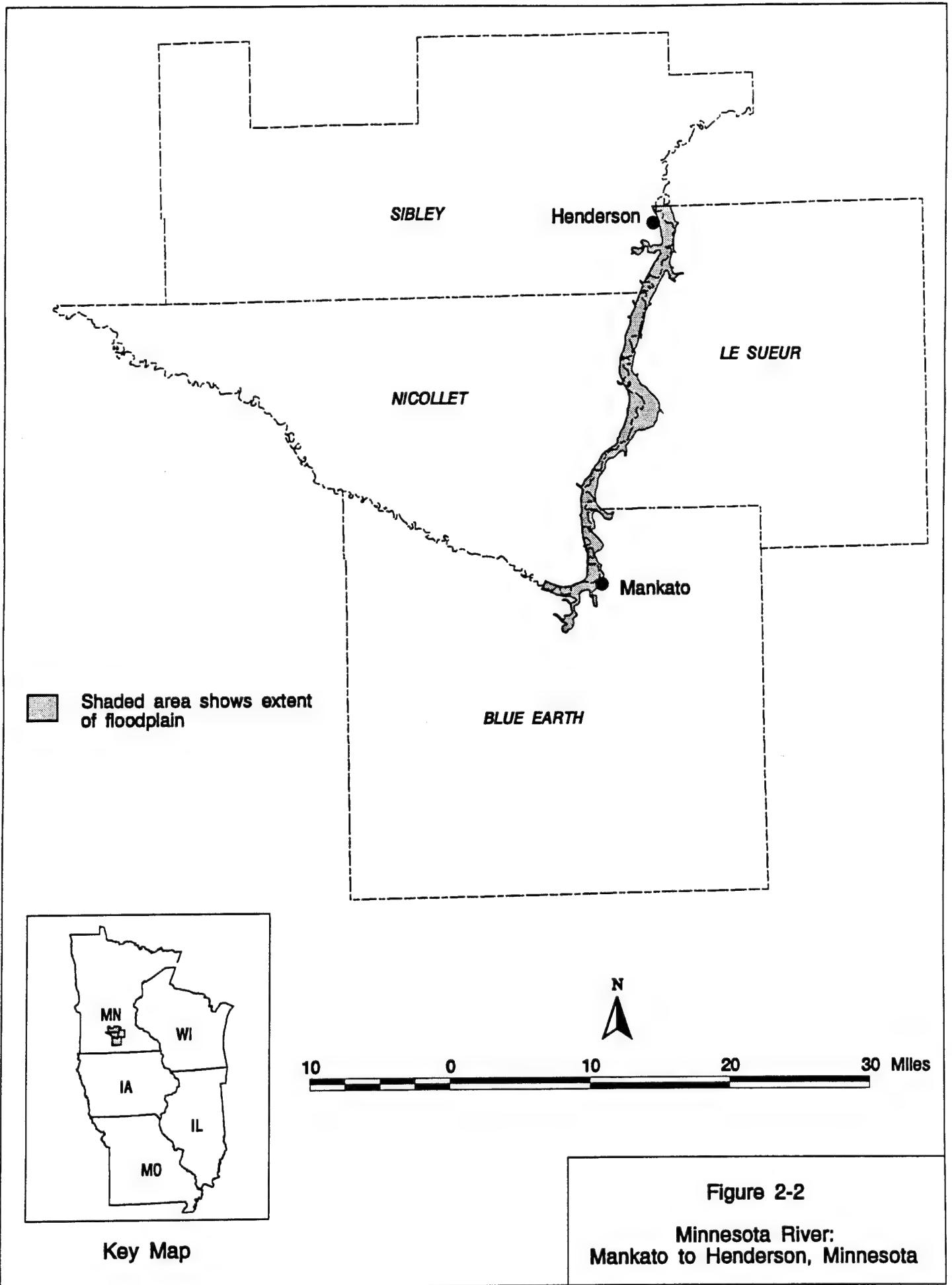


Table 2.2-2

**LAND USE/LAND COVER
MINNESOTA RIVER: MANKATO - HENDERSON**

Cover Type	Acres	Percent
Urban	3,810	17
Agriculture	8,030	36
Forest	1,050	5
Forested Wetland	3,580	16
Non-Forested Wetland	2,230	10
Water	2,470	11
Barren	1,280	6
Total	22,450	100

The floodplain has a consistent width of two miles. The river meanders within the floodplain. Scattered small lakes are found throughout the reach. The largest lake is near LeSueur in LeSueur County, Minnesota.

Agriculture is the dominant land use in the reach. Pasture is mixed with woodland and forest. The largest area of wetlands is south of LeSueur.

2.2.2.2 Vegetation

Forest and bluffs are along the edge of the floodplain. This reach is in the North Central Hardwood Forest ecological region. Maple, basswood and northern hardwoods are the dominant species (NPS, 1994).

2.2.2.3 Plant Species of Special Concern

Four plant species of special concern are found in this reach (Table 2.2-2A). All four are Minnesota threatened species, none have Federal status. The three varieties of rush and one sedge are in close proximity at the edge of the floodplain in LeSueur County.

Table 2.2-2a

**PROTECTED PLANT SPECIES OF THE MINNESOTA RIVER
MANKATO - HENDERSON**

Species	Federal Status	Minnesota Status	Site Occurrences by County
Beaked Spike-Rush	--	T	LeSueur
Hair-like Beak-Rush	--	T	LeSueur
Sterile Sedge	--	T	LeSueur
Whorled Nut-Rush	--	T	LeSueur

E = listed as endangered

T = listed as threatened

2.2.3 Aquatic Resources

2.2.3.1 Wetlands

Approximately 5,810 acres of vegetated wetlands are along this reach of the Minnesota River. The majority are classified as forested wetland (Table 2.2-3).

Table 2.2-3

**AQUATIC RESOURCES
MINNESOTA RIVER: MANKATO - HENDERSON**

Wetland Class	Acres	Percent
Forested	3,580	62
Shrub/Scrub	310	5
Emergent	1,920	33
Water Resources	Acres	Number
Lakes & Ponds	320	101

The East Minnesota River State Game Refuge begins just north of North Mankato, Minnesota, and continues north along the right descending bank to St. Peter, Minnesota. This area includes several oxbow lakes, ponds, and other wetlands areas.

Two state wildlife management areas (WMAs) are along the river near St. Peter, Minnesota. The Swan Lake WMA - Larson Supplement is located about 2 miles south of St. Peter and the Ottawa WMA is located east of St. Peter. The Ottawa WMA includes approximately 300 acres of wetlands.

South of LeSueur, Minnesota are approximately 500 acres of wetlands along the left descending bank of the river. This area includes several ponds and an oxbow lake. The Chamberlain Woods State Scientific and Natural Area is located directly south of this wetland area.

2.2.3.2 Lakes and Ponds

Approximately 101 individual lakes and ponds are located within the river segment. The total surface area of these lakes and ponds is approximately 320 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is approximately 3 acres. Some of the large lakes in the study area are an oxbow lake east of St. Peter, Minnesota, several ponds with a wetlands area south of LeSueur, Minnesota, and a series of oxbow lakes south of Henderson, Minnesota.

2.2.3.3 Tributaries

Several tributaries empty into this segment of the Minnesota River. Many of these tributaries are small perennial to intermittent streams. However, several larger water ways have their confluence within the river reach. The following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Blue Earth River	Mankato, MN
Rush River	S. of Henderson, MN
LeSueur Creek	N. of LeSueur, MN

2.2.4 Fisheries

The flathead catfish, channel catfish, and walleye are the three major game species. Northern pike, although present, are uncommon due to lack of suitable habitat. Minor aquatic species in this reach include smallmouth and largemouth bass.

Common mussel species in this reach of the Minnesota River include the threeridge and the plain pocketbook. Minor mussel species include the mucket mussel, butterfly mussel, and pink papershell.

2.2.4.1 Aquatic Species of Special Concern

No protected aquatic species have been reported from this reach of the Minnesota River.

2.2.4.2 Important Aquatic Habitat

No important habitat was identified within this reach.

2.2.5 Wildlife

The Minnesota River Valley from Mankato to Henderson provides habitat for numerous wildlife species. White-tailed deer, turkey, coyote, beaver, muskrat, and ruffed grouse are all common in this reach. Minor wildlife species include river otter, and black bear.

Bald eagles and various waterfowl species are common throughout this reach during spring, summer, and fall. Bald eagles are known to nest throughout this reach and often seen during migration. Mallards, blue-winged teal, Canada goose, and wood duck are the most common waterfowl species. Numerous waterfowl species are known to nest throughout this reach.

2.2.5.1 Wildlife Species of Special Concern

The bald eagle and Blanding's turtle are the only two threatened or endangered wildlife species known from this reach (Table 2.2-5). The Blanding's turtle is listed as threatened by the state of Minnesota. The bald eagle is Federally-listed as threatened in Minnesota and is protected under the Endangered Species Act. The bald eagle has been observed in all counties throughout this reach. Bald eagle nests are known to be in Nicollet and LeSueur Counties. The Blanding's turtle has been observed in LeSueur County south of Ottawa, Minnesota.

Table 2.2-5

PROTECTED WILDLIFE SPECIES OF THE MINNESOTA RIVER MANKATO - HENDERSON

Species	Federal Status	Minnesota Status	Site Occurrences by County
Bald Eagle	T	T	LeSueur, Nicollet
Blanding's Turtle	—	T	LeSueur

E = listed as endangered

T = listed as threatened

2.2.5.2 Important Wildlife Habitat

Important wildlife habitat occurs throughout this reach. Chamberlain Woods State Natural Area provides wetlands for Blanding's turtles and bald eagles. Swan Lake WMA provides an important nesting area for thousands of waterfowl each year. The Ottawa WMA in LeSueur County provides important waterfowl nesting areas and important deer wintering areas. A refuge between St. Peter and Mankato also provides important nesting areas for waterfowl. A power plant just north of Mankato discharges warm water into the Minnesota River providing important fishing opportunities for eagles throughout the winter.

2.2.6 Fish and Wildlife Management Areas

This study reach contains three major fish and wildlife management areas (FWMAs), all of which are state-owned. No Federal wildlife refuges are found within this study reach. The three management areas and their acreage are listed in Table 2.2-6.

Table 2.2-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MINNESOTA RIVER: MANKATO - HENDERSON**

Management Areas	State	County	Type	Acres
East Minnesota State Game Refuge	MN	Blue Earth LeSueur	S	ND
Swan Lake WMA (Larson Supplement)	MN	Nicollet	S	100
Ottawa WMA	MN	LeSueur	S	513
Total Identified Acreage				613

Type: Federal (F), State (S), Local (L) ND = No Data

The East Minnesota State Game Refuge, north of Mankato in Blue Earth County, follows the right descending bank of the Minnesota River from Mankato to the town of Kasota.

The Swan Lake WMA (Larson Supplement) is southwest of St. Peter in Nicollet County and contains both hunting and hiking facilities. The Ottawa WMA, offers hunting and biking opportunities located east of St. Peter in LeSueur County.

2.2.7 Natural Areas

Chamberlain Woods Natural Area in LeSueur County, Minnesota, is the only natural area found within this study reach (Table 2.2-7). This 254-acre state-owned area features prominent point bar succession (Minnesota DNR, 1993).

Table 2.2-7

**NATURAL AREAS
MINNESOTA RIVER: MANKATO - HENDERSON**

Natural Areas	State	County	Type	Acres
Chamberlain Woods	MN	LeSueur	S	254
Total Identified Acreage				254

2.2.8 Recreation Areas

This study reach contains five major recreation areas. State parks account for two of the five recreation areas; the remaining three are locally-owned recreation areas. No Federal recreation areas occur within this study reach. Picnicking, hunting/fishing, and hiking/biking activities were the most

commonly available recreational opportunities along this study reach; camping was less commonly available. No water activities or boat accesses were available. The majority of these recreation areas are found in Nicollet County, Minnesota. The five recreation areas and the activities which they provide are listed in Table 2.2-8.

Table 2.2-8

**RECREATION AREAS
MINNESOTA RIVER: MANKATO - HENDERSON**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Minneopa State Park	MN	Blue Earth	921	S	X	X	X	X	--
Williams County Park	MN	Nicollet	65	L	--	--	--	X	--
Seven Mile Creek County Park	MN	Nicollet	300	L	--	X	X	X	--
Minnesota Valley Trail State Park (Rush River Unit)	MN	Nicollet	260	S	--	X	X	X	--
Henderson Station County Park	MN	LeSueur	55	L	X	--	X	--	--
Total Identified Acreage			1,601						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Minneopa State Park located north of Minneopa in Blue Earth County is the largest recreation area within this study reach. Recreational opportunities available include camping, fishing, picnicking, hiking, and skiing.

The Rush River Unit of the Minnesota Valley Trail State Park is situated south of Henderson, and provides fishing, picnicking, camping, biking, hiking, horseback riding, snowmobiling, and skiing opportunities. The Rush River Unit is one of several units along the Minnesota River.

Williams County Park and Seven Mile Creek County Park are in Nicollet County, Minnesota. Williams County Park, north of the town of LeHillier, contains only one mile of a skiing/nature trail. The Seven Mile Creek area, found north of Mankato, provides 9 miles of hiking trails, 2 miles of biking trails, and 2 miles of horseback riding trails.

Henderson Station County Park, east of Henderson in LeSueur County, provides both camping and fishing opportunities.

2.2.9 Data Gaps

Technically, there were no data gaps for this reach. However, the NWI wetland data were not consistent with the land use/land cover data. The problem was that the land cover data indicated a total of only 550 acres of wetland compared to 5,810 within the NWI data. Overlaying the two files in the GIS showed that large areas of agricultural land were classified as emergent wetlands in the NWI file, as were parts of the other land use categories. Likewise, some forest areas in the land cover data overlapped forested wetland in the NWI data. The acreage in the land use/land cover table was adjusted by overlaying the NWI file on the land use file in the GIS and reducing the land

use/land cover data by the amount of wetlands from the NWI file. The total wetlands acreage in the land cover data was increased correspondingly.

2.2.10 References Cited

Minnesota Department of Natural Resources. 1993. *Public Recreation Information Map: Faribault*. St. Paul, MN.

National Park Service. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance*.

2.3 MINNESOTA RIVER: HENDERSON TO ST. PAUL, MINNESOTA

This study reach covers the lower part of the Minnesota River (see Figure 2-3). It is approximately 50 river miles in length. The upper end begins near Henderson, Minnesota, and it ends where the Minnesota River enters the Mississippi River, which is upstream from St. Paul. Five counties fall within the study reach. The river passes through the southern suburbs of Minneapolis.

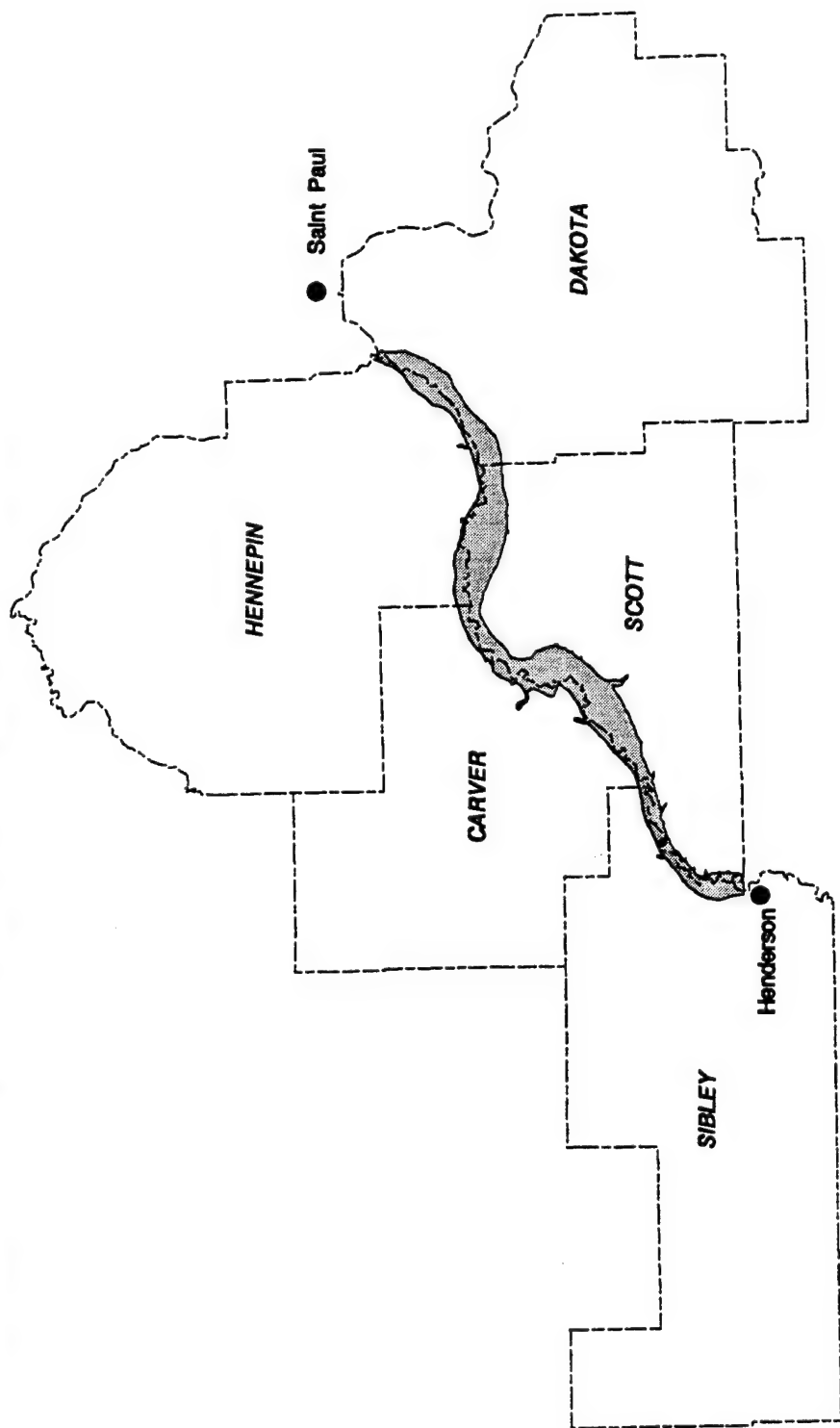
2.3.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.3-1. Descriptions of the state soil associations are provided in Appendix A.

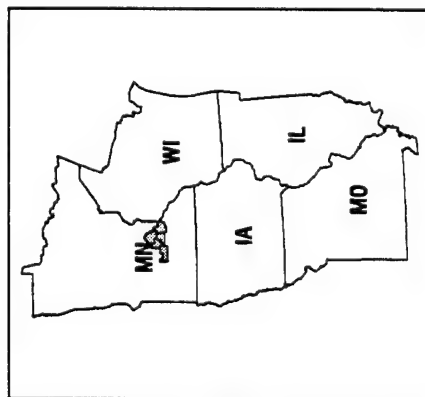
Table 2.3-1

SOIL ASSOCIATIONS MINNESOTA RIVER: HENDERSON - ST PAUL

Soil Association	State	Occurrences	Acres	Percent
ESTHERVILLE-DICKMAN-DAKOTA	MN	5	130	<1
CHASKA-MINNEISKA-COLO	MN	3	39,540	70
WAUKEGAN-WADENA-HAWICK	MN	2	710	1
LESTER-HAWICK-TERRIL	MN	10	3,280	6
SPARTA-ESTHERVILLE-WAUKEGAN	MN	6	10,790	19
LESTER-HAYDEN-MUSKEGO	MN	1	<10	<1
LESTER-KILKENNY-HOUGHTON	MN	1	80	<1
ERIN-KILKENNY-BOOTS	MN	3	240	<1
ETTER-ROCKTON-COPASTON	MN	1	1,630	3
FAIRHAVEN-ESTHERVILLE-BISCAY	MN	1	<10	<1
LESTER-LESUEUR-CORDOVA	MN	3	120	<1
SOIL ASSOCIATIONS SUB TOTAL	--	36	56,530	100
UNCLASSIFIED AQUATIC	MN	--	--	--
SOILS AND AQUATIC TOTAL	--	--	56,530	--



Shaded area shows extent of floodplain



Key Map

Figure 2-3

Minnesota River:
Henderson to St. Paul, Minnesota

2.3.2 Land Use/Land Cover

2.3.2.1 Land Use

The total area of floodplain within this reach encompasses 56,530 acres (Table 2.3-2). The northern end of the reach, in the vicinity of St. Paul, is urban. Scattered small, rural communities are along the remainder of the reach. Fort Snelling Reservation is located at the confluence of the Minnesota and Mississippi Rivers. A designated scenic road follows the right descending bank of the river.

Table 2.3-2

**LAND USE/LAND COVER
MINNESOTA RIVER: HENDERSON - ST. PAUL**

Cover Type	Acres	Percent
Urban	8,340	15
Agriculture	25,120	44
Forest	3,970	7
Forested Wetland	6,030	11
Non-Forested Wetland	5,130	9
Water	7,530	13
Barren	410	1
Total	56,530	100

Agriculture is the primary land use in the reach. Large areas of wetlands are found near Ft. Snelling.

The river meanders within the one to two-mile wide floodplain creating numerous small lakes and ponds. The river widens to over three miles at Belle Plains and maintains the width to Shakopee. From Shakopee to Bloomington there are a series of large lakes, including Grass Lake, Blue Lake and Fisher Lake.

2.3.2.2 Vegetation

This reach is in the North Central Hardwood Forest ecological region. This region is a combination of cropland, woodland, and forest. The dominant forest species are maple, basswood and northern hardwoods (NPS, 1994). Small amounts of forest are scattered along the river. Large areas of forested wetlands are found where smaller tributaries feed into the river.

2.3.2.3 Plant Species of Special Concern

Six of the seven species of special concern are located in Dakota County (Table 2.3-2a). The beaked spike-rush is found in Scott County. All the plants are listed as threatened by the state of Minnesota. None of the species are Federally listed.

Table 2.3-2a

PROTECTED PLANT SPECIES OF THE MINNESOTA RIVER HENDERSON - ST. PAUL

Species	Federal Status	Minnesota Status	Site Occurrences by County
Beaked Spike-Rush	--	T	Scott
Hair-like Beak-Rush	--	T	Dakota
Sterile Sedge	--	T	Dakota (5)
Sullivants Milkweed	--	T	Dakota
Tuberous Indian-Plaintain	--	T	Dakota
Valerian	--	T	Dakota (6)
Whorled Nut-Rush	--	T	Dakota

E = listed as endangered

T = listed as threatened

2.3.3 Aquatic Resources

2.3.3.1 Wetlands

Within this study reach, there are approximately 17,930 acres of vegetated wetland located in the adjacent floodplain. The majority are classified as emergent wetlands (see Table 2.3-3). The vegetated wetlands appear to be evenly distributed along the river. Many of the wetland areas are refuge units within the Minnesota Valley National Wildlife Refuge and Recreation Area. This area covers the Minnesota River and numerous backwater lakes between Jordan, Minnesota, and the river's confluence with the Mississippi River in St. Paul.

Table 2.3-3

**AQUATIC RESOURCES
MINNESOTA RIVER: HENDERSON - ST. PAUL**

Wetland Class	Acres	Percent
Forested	6,030	34
Shrub/Scrub	720	4
Emergent	11,180	62
Water Resources	Acres	Number
Lakes & Ponds	4,390	76

The Louisville Swamp Refuge Unit is located north of Jordan, Minnesota. This area includes a complex of wetlands that includes the Louisville Swamp, Johnson Slough, and several small creeks that feed this wetland area. To the north of this management unit is an area of wetlands surrounding Gifford Lake.

A wetland area adjacent to Nyssens Lake and several other small lakes is located west of Shakopee, Minnesota. Other wetland areas to the north of Shakopee are partially within the Raquet State WMA and the Upgralia Refuge Unit.

The Wilke Refuge Unit is located south of Bloomington, Minnesota. This area includes wetland areas surrounding several backwater lakes. Additional wetlands are present to the east of the Wilke Refuge Unit, in the area surrounding Rice Lake and other small lakes. The Black Dog Lake and Long Meadow Lake Refuge Units are located near Richfield, Minnesota. These areas contain wetlands associated with two large backwater lakes.

Several wetland areas are also found within Fort Snelling State Park. These wetlands are located adjacent to several backwater lakes and at the confluence of the Minnesota and Mississippi Rivers.

2.3.3.2 Lakes and Ponds

Approximately 76 individual lakes and ponds are located within the river segment. The total surface area of these lakes and ponds is approximately 4,390 acres. The average size of each pond or lake is approximately 58 acres.

As with the wetland areas, many of these water bodies are found in association with state or Federally managed lands. For this study section, many of the lakes are within either the Minnesota Valley National Wildlife Refuge and Recreation Area or the Minnesota Valley Trail State Park. The following is a list of the largest lakes and their locations:

Lake	Location
Browns Lake	N.E. of Belle Plain, MN
Kelly Lake	W. of Jordan, MN
Ahlswede Lake	W. of Jordan, MN
Lundquist Lake	N. of Jordan, MN
Long Lake	S. of Chaska, MN
Nyssens Lake	Shakopee, MN
Rice Lake	N. of Shakopee, MN
Grass Lake	E. of Shakopee, MN
Blue Lake	Savage, MN
Fisher Lake	Savage, MN
Rick Lake	Savage, MN
Black Dog Lake	Mendota Heights, MN
Long Meadow Lake	Richfield, MN
Gun Club Lake	Mendota Heights, MN

2.3.3.3 Tributaries

Several tributaries empty into the Minnesota River within this reach. Many of these tributaries are small perennial or intermittent streams which drain directly into wetland areas.

2.3.4 Fisheries

The Minnesota River is a major tributary to the Mississippi and provides a diversity of aquatic habitats. Major aquatic species in this reach of the Minnesota River include walleye, northern pike, smallmouth bass, and channel and flathead catfish. Minor species include largemouth bass and white bass. Species important to the commercial fishery include carp, freshwater drum, carpsucker, and buffalo. Carp, freshwater drum, and shorthead redhorse were the three most frequently sampled species in this reach in 1992 (Polomis, 1992)

2.3.4.1 Aquatic Species of Special Concern

The Higgins' Eye Pearly Mussel is the only protected aquatic species known to occur in from this reach of the Minnesota River (Table 2.3-4). One occurrence of the Higgins' Eye Pearly Mussel has been reported from Carver County near Chaska.

Table 2.3-4

**PROTECTED AQUATIC SPECIES OF THE MINNESOTA RIVER
HENDERSON - ST. PAUL**

Species	Federal Status	Minnesota Status	Site Occurrences by County
Higgin's Eye Pearly Mussel	E	E	Carver

E = listed as endangered

T = listed as threatened

2.3.4.2 Important Aquatic Habitat

The Minnesota Valley National Wildlife Refuge which occurs throughout this reach provides important habitat for all aquatic species. The diversity of habitats contained by this refuge varies from lake-type habitats to wetlands and stream-type habitats. Black Dog Lake, Long Meadow Lake, Grass and Fisher Lakes all provide important spawning and rearing habitat for bass, walleye, and pike. In Sibley County, the Minnesota River provides stream-type habitat important to smallmouth bass.

2.3.5 Wildlife

This reach of the Minnesota River provides habitat for thousands of migrating waterfowl each year. Over 275 species of birds have been observed in the Minnesota Valley National Wildlife Refuge (MVNWR) during migration (MVNWR, 1993). The many lakes and ponds of the refuge provide important waterfowl nesting habitat. Surveys in 1980 and 1981 indicated over 2,000 ducks are raised on the refuge annually. Major wildlife species include white-tailed deer, river otter, muskrat, and raccoon. Various species of shorebirds, herons, and egrets are common throughout this reach. Bald eagles are known to nest on the refuge and are common transients during migration.

2.3.5.1 Wildlife Species of Special Concern

Three species of special concern are known to occur in this reach (Table 2.3-5). Two of these species are birds and one is a reptile. Both the peregrine falcon and bald eagle have Federal protection under the Endangered Species Act. The bald eagle is listed as threatened; the peregrine falcon as endangered. The Blanding's turtle is listed as threatened in Minnesota. The bald eagle is common throughout this reach and several nest sites have been observed on the MVNWR. The peregrine falcon has been observed in Dakota County, near Fort Snelling State Park. The Blanding's turtle has been observed in Hennepin County near Mendota.

Table 2.3-5

**PROTECTED WILDLIFE SPECIES OF THE MINNESOTA RIVER
HENDERSON - ST. PAUL**

Species	Federal Status	Minnesota Status	Site Occurrences by County
Bald Eagle	T	T	Hennepin
Blanding's Turtle	--	T	Hennepin
Peregrine Falcon	E	E	Dakota

E = listed as endangered

T = listed as threatened

2.3.5.2 Important Wildlife Habitat

Wetlands, ponds, and lakes distributed throughout this reach provide important habitat for the Blanding's turtle. Blue Lake and Louisville Swamp in the MVNWR provide important habitat for great-blue herons, great egrets, and double-crested cormorants. Both of these areas are historic rookery sites. In 1993, an estimated 796 fledglings were raised at the Blue Lake site. This number includes great egrets and double-crested cormorants (MVNWR, 1993).

The Louisville Swamp rookery contained 96 great-blue heron nests and one great egret nest in 1993 (MVNWR, 1993). Numerous wetlands, lakes and ponds throughout this reach provide important habitat for migrating and nesting waterfowl and bald eagles. In particular, Long Meadow Lake and the Wilke Refuge unit provide exceptional wetland habitat.

2.3.6 Fish and Wildlife Management Areas

This study reach contains eight major FWMAs, which cover over 11,000 acres of land. Federal wildlife refuges account for seven of the eight FWMAs, the eighth management area is state-owned. The MVNWR contains 11,166 of the 11,378 acres within this study reach. A bald eagle nest was recorded in the Long Meadow Lake Refuge Unit in 1989. A great blue heron colony occurs within the Wilke Refuge Unit (MVNWR, 1993). The eight management areas are listed in Table 2.3-6, the acreage of each is also listed.

Table 2.3-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MINNESOTA RIVER: HENDERSON - ST. PAUL**

Management Areas	State	County	Type	Acres
MVNWR (Louisville Swamp Refuge Unit)	MN	Scott	F	2,000
MVNWR (Chaska Lake Refuge Unit)	MN	Carver	F	580
Raguet WMA	MN	Carver	S	212
MVNWR (Upgralia Refuge Unit)	MN	Hennepin	F	2,400
MVNWR (Wilke Refuge Unit)	MN	Scott	F	2,300
MVNWR (Bloomington Ferry Refuge Unit)	MN	Hennepin	F	380
MVNWR (Black Dog Lake Refuge Unit)	MN	Dakota	F	1,306
MVNWR (Long Meadow Lake Refuge Unit)	MN	Hennepin	F	2,200
Total Identified Acreage				11,378

Type: Federal (F), State (S), Local (L)

ND = No Data

The MVNWR is one of the few urban wildlife refuges in the U.S. (USFWS, 1991). Seven refuge units are contained within this national wildlife refuge, including Louisville Swamp, Chaska Lake, Upgralia, Wilke, Bloomington Ferry, Black Dog Lake, and Long Meadow Lake. Of these seven units, the Upgralia Refuge Unit is the largest with 2,400 acres, while the Bloomington Ferry Refuge Unit only contains 380 acres.

The refuge follows the Minnesota River from the town of Mudbaden to Fort Snelling State Park, through the counties of Scott, Carver, Hennepin, and Dakota. The Louisville Swamp Refuge Unit is the western-most unit; the Long Meadow Lake Refuge Unit is the eastern-most unit. Within this national refuge is the Minnesota Valley State Park and Trail. Many different wildlife species inhabit the refuge, including bald eagles, badgers, coyotes, bats, gray and red fox, and beavers. Bird species also flourish within the area, including wood duck, spotted sandpiper, red-tailed hawk, and black tern. Two protected species, the bald eagle and great blue heron, have been known to frequent the area.

The Raguet WMA is located northwest of Chaska between Nyssens Lake and Chaska Lake in Carver County, Minnesota. Opportunities for fishing, hunting, and hiking are available.

2.3.7 Natural Areas

Two natural areas totalling 175 acres are found within this study reach. The natural areas are listed by state, county, acreage, and type in Table 2.3-7.

Table 2.3-7

NATURAL AREAS
MINNESOTA RIVER: HENDERSON - ST. PAUL

Natural Areas	State	County	Type	Acres
Black Dog Preserve State Natural Area	MN	Dakota	S	130
Savage Fen State Natural Area	MN	Scott	S	45
Total Identified Acreage				175

Type: Federal (F), State (S), Private (P) ND = No Data

Black Dog Preserve is a state natural prairie bordering Black Dog Lake north of Burnsville. Savage Fen State Natural Area is located in the northeast corner of Scott County (Minnesota DNR, 1992).

2.3.8 Recreation Areas

This study reach contains eight major recreation areas, covering over 6,500 acres of land and water. All of these recreation areas are state parks. The Minnesota Valley Trail State Park, located along the Minnesota River, contains 5,010 of the total 6,540 acres within the study reach. Hunting/fishing and hiking/biking activities were the most commonly available recreational opportunities along this study reach. Camping, picnicking, and water activities were less common. The majority of these recreation areas are found in Scott County, Minnesota. The eight recreation areas and the activities which they provide are listed in Table 2.3-8.

Table 2.3-8

RECREATION AREAS
MINNESOTA RIVER: HENDERSON - ST. PAUL MINNESOTA

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Minnesota Valley State Park (Blakely Unit)	MN	Scott	380	S	—	—	—	—	—
Minnesota Valley State Park (Lawrence Unit)	MN	Scott, Carver	2,500	S	X	X	X	X	X*
Minnesota Valley State Park (Thompson Ferry Unit)	MN	Scott	80	S	—	—	X	X	X*
Minnesota Valley State Park (Carver Rapids Unit)	MN	Scott	530	S	X	—	X	X	X*
Minnesota Valley State Park (Gifford Lake Unit)	MN	Scott	800	S	X	—	X	X	—
Minnesota Valley State Park (Nyssen Unit)	MN	Scott	600	S	—	—	X	X	—
Minnesota Valley State Park (Rice Lake Unit)	MN	Scott	120	S	—	X	X	—	X*
Fort Snelling State Park	MN	Dakota, Hennepin	1,530	S	X	X	X	X	X*
Total Identified Acreage			6,540						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Seven units of the Minnesota Valley Trail State Park are located within this study reach. They include the Blakely, Lawrence, Thompson Ferry, Carver Rapids, Gifford Lake, Nyssens Lake, and Rice Lake units. The seven units of the park are found along the Minnesota River, beginning with the Blakely Unit located south of the town of Blakely in Scott County, Minnesota, and ending with the Rice Lake Unit which is southwest of Bloomington in Scott County. Many different recreational activities exist within this state park, including fishing, picnicking, camping, hiking, horseback riding, snowmobiling, and skiing. Boat and canoe access are available at five of the seven sites.

In 1821, Josiah Snelling directed the construction of Fort Snelling State Park which is west of Mendota Heights in Dakota and Hennepin Counties (Minnesota DNR, 1988). The park provides picnicking, fishing, swimming, 18 miles of hiking and skiing trails, 5 miles of biking trails, an historic site, polo grounds, an interpretive center, boat access, and a golf course. The park is situated within forested river bottoms comprised of cottonwood, elm, and maple. The wildlife inhabiting the area include badgers, woodchucks, fox, deer, skunks, and the fox snake (Minnesota DNR, 1988).

2.3.9 Data Gaps

There were no data gaps for this study reach.

2.3.10 References Cited

Minnesota Department of Natural Resources. 1988. *Fort Snelling State Park* pamphlet. Explore Minnesota State Parks. St. Paul, MN.

Minnesota Department of Natural Resources. 1992. *Public Recreation Information Map: South Metro Area*. St. Paul, MN.

Minnesota Valley National Wildlife Refuge. 1993. *Annual Narrative Report*. Bloomington, Minnesota.

National Park Service. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance*.

Polomis, Taylor. 1992. *1992 Minnesota River Fish Survey*. Minnesota Department of Natural Resources. Twin Cities, MN.

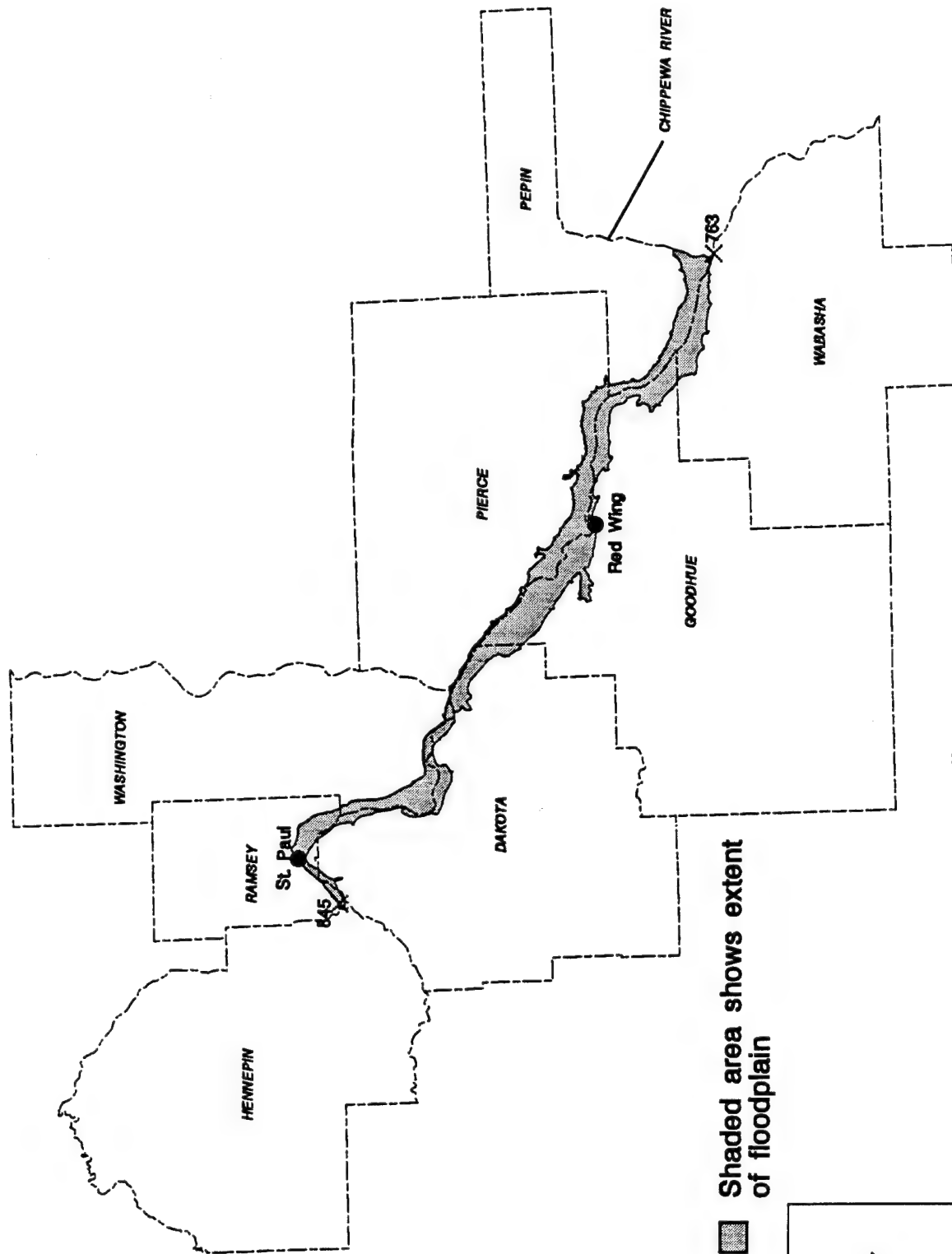
U.S. Fish and Wildlife Service. 1991. *Minnesota Valley National Wildlife Refuge* brochure. Bloomington, MN.

2.4 MISSISSIPPI RIVER: ST. PAUL, MINNESOTA TO THE CHIPPEWA RIVER

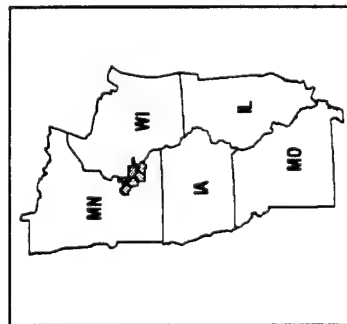
This study reach begins where the Minnesota River joins the Mississippi River, just upstream from St. Paul, Minnesota near RM 845 (see Figure 2-4). It is approximately 82 river miles in length. St. Paul is included in this reach, as well as Hastings, Minnesota, and Red Wing, Minnesota. This reach ends where the Chippewa River enters the Mississippi River, near RM 763. Two states (Minnesota and Wisconsin) and eight counties are in this study reach. The Minnesota, St. Croix, and Chippewa Rivers are the primary tributaries entering the Mississippi River along this reach.

2.4.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.4-1. Descriptions of the state soil associations are provided in Appendix A.



Shaded area shows extent of floodplain



Key Map

Figure 2-4

Mississippi River:
St. Paul to the Chippewa River

Table 2.4-1

**SOIL ASSOCIATIONS
MISSISSIPPI RIVER: ST PAUL - CHIPPEWA RIVER**

Soil Association	State	Occurrences	Acres	Percent
COPASTON-CHASKA-MINNEISKA	MN	3	570	<1
CHASKA-MINNEISKA-COLO	MN	1	5,950	9
KINGSLEY-MAHTOMEDI-QUAM	MN	6	980	1
SPARTA-COPASTON-BURKHARDT	MN	1	5,430	8
WAUKEGAN-WADENA-HAWICK	MN	17	1,400	2
ESTHERVILLE-DICKMAN-DAKOTA	MN	1	20	<1
DICKMAN-SPARTA-ESTHERVILLE	MN	1	3,170	5
WAUKEGAN-BAYTOWN-RIPON	MN	1	940	1
OSTRANDER-BAYTOWN-RIPON	MN	1	<10	<1
MCPAUL-RADFORD-ZUMBRO	MN	4	22,890	35
ROSHOLT-CHETEK-MENAHGA	WI	2	50	<1
MCPAUL-RADFORD-ZUMBRO	WI	2	5,530	8
HUBBARD-SPARTA-PLAINFIELD	MN	2	510	<1
STONY.AND.ROCKY.LAND-SEATON-BOONE	WI	14	1,940	3
ESTHERVILLE-WAUKEGAN-DICKINSON	MN	4	8,190	12
SPARTA-GOTHAM-PLAINFIELD	WI	2	5,670	9
TIMULA-FRONTENAC-SEATON	MN	9	320	<1
SEATON-FRONTENAC-CHASEBURG	MN	4	370	<1
ABSCOTA-GLENDORA-KALMARVILLE	WI	1	2,080	3
LACRESCENT-ELBAVILLE-LAMOILLE	MN	7	170	<1
COMFREY-SHILOH	WI	1	60	<1
SOIL ASSOCIATIONS SUB TOTAL	--	84	66,250	100
UNCLASSIFIED AQUATIC	ALL	1	32,530	--
SOILS AND AQUATIC TOTAL	--	-	98,780	--

2.4.2 Land Use/Land Cover

2.4.2.1 Land Use

The total area of floodplain within this reach covers 98,780 acres (see Table 2.4-2). The northern end of the reach is urban through the middle of St. Paul, Minnesota. The remainder of the reach is primarily rural with scattered small communities along the river. Railroad lines are found on both sides of the river. Roads on both banks of the river are designated as portions of the Great River Road, the nation's longest scenic byway (National Park Service (NPS), 1994). The river is a narrow channel through St. Paul. Lakes are formed where the locks and dams hold back the water.

Table 2.4-2

LAND USE/LAND COVER MISSISSIPPI RIVER: ST. PAUL - CHIPPEWA RIVER

Cover Type	Acres	Percent
Urban	11,560	12
Agriculture	19,430	20
Upland Forest	350	< 1
Forested Wetland*	13,940	14
Non-Forested Wetland	8,370	8
Water	45,130	46
Barren	0	--
Total	98,780	100

*Extrapolated from partial coverage.

2.4.2.2 Vegetation

The north end of the reach is within the Western Corn Belt Plains ecological region (ecoregions) as defined by the U.S. Environmental Protection Agency (EPA). An ecoregion is an area of similar landscape and climate which supports similar vegetation. Dominant plant species are bluestem prairie grasses. The primary land use is agriculture (NPS, 1994). Several large areas of agricultural land are along this reach; particularly below St. Paul, above Lock and Dam 3, and on the west side of Lake Pepin.

Scattered forested islands are located in the northern half of the reach. These floodplain forests are seasonally flooded. The dominant species are black willows and cottonwoods or silver maples (Minnesota DNR, 1988 and 1990). Another extensive area of forested wetland is found between RM 807 and 812.

2.4.2.3 Plant Species of Special Concern

Seven plant species of special concern are found in this reach (Table 2.4-2a). All but one are listed by the states of Minnesota or Wisconsin as endangered. The Illinois tick-trefoil is listed as threatened in Minnesota. None of these species have Federal designation. The plants occur in two concentrations. The Illinois tick-trefoil, kittentails, and James' polanisia all occur in the vicinity of Baldwin Lake in Dakota County, Minnesota. The bladderpot, prairie plum, dotted blazing star, and Carolina anemone are all found in Pierce County, Wisconsin, near Gantenbein Lake.

Table 2.4-2a

PROTECTED PLANT SPECIES OF THE MISSISSIPPI RIVER ST. PAUL - CHIPPEWA RIVER

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Bladderpod	--	E	T	Goodhue Pierce
Carolina Anemone	--	--	E	Pierce
Dotted Blazing Star	--	--	E	Pierce
Illinois Tick-Trefoil	--	T	--	Washington Dakota
James' Polanisia	--	E	--	Dakota
Kitten-Tails	--	E	T	Washington Dakota
Prairie Plum	--	--	E	Pierce

E = listed as endangered

T = listed as threatened

2.4.3 Aquatic Resources

2.4.3.1 Wetlands

Along the Mississippi River within this study reach there are approximately 22,310 acres of vegetated wetlands located in the adjacent floodplain. The majority are classified as forested wetlands (Table 2.4-3). The vegetated wetlands appear to be evenly distributed along the river segment. Large forested wetland habitats are located on several islands that have formed within the channel of the Mississippi. Two major islands contain significant wetlands. Pike Island (RM 845) is located at the confluence of the Minnesota River. Gray Cloud Island (RM 827) is located south of St. Paul Park.

Table 2.4-3

AQUATIC RESOURCES¹
MISSISSIPPI RIVER: ST. PAUL - CHIPPEWA RIVER

Wetland Class	Acres	Percent
Forested	13,940	63
Shrub/Scrub	1,010	4
Emergent	7,360	33
Water Resources	Acres	Number
Lakes & Ponds	39,110	128

¹Extrapolated from 70 percent coverage.

At the confluence of the Minnesota River wetlands are on both sides of the river. This area includes three small lakes, an oxbow lake, Pike Island, and other wetlands areas surrounding these features. Near the St. Paul downtown airport an area of wetland is on the right descending bank of the river. Several wetlands areas also surround Pig's Eye Lake on the east side of the river.

A large system of wetlands, backwater lakes, and islands extends along the right descending bank of the river between RM 810 and RM 800. In this area the Vermillion River runs parallel to the Mississippi River on the right descending bank. This area includes the Gores WMA, Clear Lake and Upper Clear Lake, and numerous other smaller lakes and sloughs.

Near Lock and Dam 3 north of Red Wing, wetlands are present on both sides of the river. A large area of wetlands extends downstream from the lock and dam to the city of Red Wing. This is also the area where the Cannon River and several smaller creeks enter the Mississippi River floodplain.

Wetlands, backwater lakes, islands, and sloughs occur at the west end of the Lake Pepin, to the east of Red Wing. A wetlands area is also present where Isabelle Creek enters the north side of Lake Pepin. Between the cities of Red Wing and Lake City, Minnesota, a wetlands area is present on the north side of Lake Pepin, where the Rush River enters the lake. This wetland area forms a large point with several small ponds.

At the confluence of the Chippewa River, a large area of wetlands is along the north side of the river. This includes the Nelson Trevino Research Area to the east of the Chippewa River. These wetlands also extend several miles upstream along the Chippewa River.

2.4.3.2 Lakes and Ponds

Approximately 128 individual lakes and ponds are within this river segment. The total surface area of these lakes and ponds is approximately 39,110 acres including Lake Pepin.

As with the wetland areas, many of these water bodies are where tributaries enter the river and below locks and dams. The water bodies are also frequently associated with vegetated wetlands. Several

lakes and ponds are located within the floodplain between Hastings and Red Wing, Minnesota, where the Vermillion River runs along the Mississippi.

Several lakes are also at the confluence of the Minnesota River. Following is a list of the largest lakes and their locations:

Lake	Location	River Mile
Pickerel Lake	Lilydale, MN	842
Lake Isabelle	Hastings, MN	813
Clear Lake	N. of Red Wing, MN	804
Nelson Lake	N. of Red Wing, MN	801
Larson Lake	N. of Red Wing, MN	801

Baldwin Lake and Spring Lake are above Lock and Dam 2. A series of lakes, Twin Lake, North Lake and Sturgeon Lake, are above Lock and Dam 3. Lake Pepin is an extensive lake stretching from RM 786 to the confluence of the Chippewa River at RM 763.

2.4.3.3 Tributaries

Several tributaries empty into the Mississippi River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
Minnesota River	Mendota Heights, MN	844
St. Croix River	Prescott, WI	812
Wild River	N. of Red Wing, MN	801
Vermillion River	E. of Hastings, MN	796
Cannon River	N. of Red Wing, MN	792
Trimble River	E. of Red Wing, MN	780
Rush River	N.W. of Wabasha, MN	764
Chippewa River	N. of Red Wing, MN	764

2.4.4 Fisheries

This reach provides a variety of aquatic habitats, from deepwater habitats in Pool 2 to lake-type habitats in Lake Pepin in Pool 4. Important gamefish in this reach include sauger, northern pike,

walleye, crappie, bluegill, and both large and smallmouth bass. Important species caught commercially include carp, small and largemouth buffalo, drum and channel catfish.

2.4.4.1 Aquatic Species of Special Concern

Six aquatic species with protected status occur in this reach (Table 2.4-4). Five of these species are fish and one is a mussel. The Higgins' Eye Pearly Mussel is the only aquatic species with Federal protection under the Endangered Species Act. All six species are listed as threatened or endangered by Wisconsin. The Higgins' Eye Pearly Mussel is listed as endangered in Minnesota. None of the fish species are listed as threatened or endangered by Minnesota.

Pool 4 contains all six of the protected aquatic species. The paddlefish, goldeye, and pallid shiner all have been observed in Pool 4 in Pierce County, Wisconsin. The black buffalo has been observed in Pool 4 in Pepin County. No protected species have been observed in Pool 2 up to RM 845.

2.4.4.2 Important Aquatic Habitat

Pepin Lake provides the most important habitat for aquatic species in this reach. It is no coincidence that the highest number of protected species in this reach occur in Pepin Lake. Pepin Lake provides excellent habitat for aquatic species and is the only natural river lake in the Midwest (Stevens, 1994).

In addition to Pepin Lake (RM 775), this reach contains two important tailwater areas and numerous backwater areas important to fish as spawning and rearing habitat. Spring Lake in Pool 2 and Sturgeon Lake in Pool 3 both provide important spawning and rearing habitat for aquatic species.

Table 2.4-4

PROTECTED AQUATIC SPECIES OF THE MISSISSIPPI RIVER ST. PAUL - CHIPPEWA RIVER

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Black Buffalo	--	--	T	Pierce
Goldeye	--	--	E	Pierce, Pepin
Higgins' Eye Pearly Mussel	E	E	E	Pierce
Paddlefish	--	--	T	Pierce, Pepin
Pallid Shiner	--	--	E	Pierce
Speckled Chub	--	--	T	Pierce

E = listed as endangered

T = listed as threatened

2.4.5 Wildlife

The upper part of this reach around Pool 2, near St. Paul, has been developed and contains little habitat for wildlife. However, areas in Pools 3 and 4 contain notable habitat for wildlife. Major wildlife species in this reach include white-tailed deer, muskrats, raccoons, woodchucks, bald eagles, ospreys, and numerous species of waterfowl. Peregrine falcons have also been observed in this reach. The reach contains important nesting habitat for many species of waterfowl. Many species of ducks use the backwater areas and lakes in this reach to raise their young.

2.4.5.1 Wildlife Species of Special Concern

Four protected wildlife species are in this reach (Table 2.4-5). Two of these species are birds and two are turtles. The bald eagle and peregrine falcon are the only two wildlife species with Federal protection under the Endangered Species Act. The bald eagle is Federally-listed as threatened in Minnesota and Wisconsin, and the peregrine falcon is Federally-listed as endangered. The Blanding's turtle and wood turtle are listed as threatened in Minnesota and Wisconsin. The peregrine falcon has been observed in this study reach.

Table 2.4-5

PROTECTED WILDLIFE SPECIES OF THE MISSISSIPPI RIVER ST. PAUL - CHIPPEWA RIVER

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Bald Eagle	T	T	T	Ramsey(2), Dakota(3), Goodhue(9), Washington
Blanding's Turtle	—	T	T	Wabasha, Dakota, Ramsey, Goodhue
Peregrine Falcon	E	E	E	Ramsey, Dakota, Wabasha, Pepin
Wood Turtle	—	T	T	Washington, Goodhue

E = listed as endangered

T = listed as threatened

Dakota, Goodhue and Ramsey counties each contain three of the protected species. Pool 3 contains the highest number of occurrences of protected species, followed by Pool 2. Six occurrences of the bald eagle are reported from Pool 3 and five are reported from Pool 4. Two occurrences of the Blanding's turtle have been reported from Pool 2 near St. Paul and two occurrences are reported from Pool 3. The wood turtle also has been observed in this study reach.

2.4.5.2 Important Wildlife Habitat

Pig's Eye Lake in Pool 2 is a 500-acre floodplain lake that is home to the largest black-crowned night heron rookery in the country (Minnesota DNR, 1993). Spring Lake, also in Pool 2, provides important fishing areas for bald eagles and resting areas for migrating waterfowl. In Pool 3, the

Gores and Ravenna State Wildlife Management areas provide important habitat for a diversity of wildlife species. The Pierce County Islands public hunting area in upper Pool 4 contains important habitat for various species of shore and wading birds. Pepin Lake in Pool 4 is the only natural river lake in Minnesota. Pepin Lake is an important staging area for canvasbacks and geese. A bald eagle night roost has been reported from Pool 4 also in Pepin Lake.

2.4.6 Fish and Wildlife Management Areas

This study reach contains three major FWMAs, the majority of which are located within Goodhue County, Minnesota. State wildlife refuges account for two of the management areas, the third area is either state- or locally-owned. No national wildlife refuges are found within this study reach. The three management areas are listed by state in Table 2.4-6; the acreage of each area is also provided.

Table 2.4-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MISSISSIPPI RIVER: ST. PAUL - CHIPPEWA RIVER**

Management Areas	State	County	Pool	Type	Acres
Gores Pool State Wildlife Mgmt. Area	MN	Dakota, Goodhue	3	S	2,679
Perched Valley Wildlife Mgmt Area	MN	Goodhue	4	S	291
Pierce County Islands Wildlife Area	WI	Pierce	4	ND	ND
Total Identified Acreage					2,970

Type: Federal (F), State (S), Local (L) **ND** = No Data

The Gores Pool State WMA is located southeast of Hastings and contains several lakes of varying sizes, including Mud Hen Lake, Sharp Muskrat Lake, Twin Lakes, and North Lake. A portion of the Vermillion River is adjacent to the west side of the Gores Pool area. Fishing, hunting, and hiking opportunities are available.

The Perched Valley WMA, situated west of the town of Frontenac in Goodhue County, Minnesota, surrounds Grotes Pond and provides hunting and hiking opportunities.

2.4.7 Natural Areas

This study reach has three natural areas totalling nearly 500 acres. Areas include rookery habitat, forested delta, and wildflower areas. Information on the natural areas is provided in Table 2.4-7.

Table 2.4-7

NATURAL AREAS
MISSISSIPPI RIVER: ST. PAUL - CHIPPEWA RIVER

Natural Areas	State	County	Pool	Type	Acres
Pig's Eye Island Heron Rookery Natural Area	MN	Ramsey	2	S	100
Hasting's State Natural Area	MN	Dakota	3	S	69
Rush River State Natural Area	WI	Pierce	4	S	325
Total Identified Acreage					494

Type: Federal (F), State (S), Private (P) ND = No Data

Two of the natural areas are in Minnesota. Pig's Eye Island Heron Rookery Natural Area is in South St. Paul. This state-owned rookery covers 100 acres. The Hasting's State Natural Area is near the city of Hastings. This state owned area is known for wildflowers (Minnesota DNR, 1992).

The Rush River Delta State Natural Area is west of Maiden Rock, Wisconsin. This area features a wet-mesic forest on the delta of the Rush River where the river extends into Lake Pepin. Sandy areas serve as sites for turtles, gulls, and terns. Warblers, nesting vireos, orioles, and woodpeckers use forested areas. The site also provides nesting habitat for two state-listed bird species (Wisconsin DNR, 1989).

2.4.8 Recreation Areas

This study reach contains 21 major recreation areas, most of the areas are in Minnesota. State parks account for two of the 21 recreation areas; the remaining 19 recreation areas are locally-owned. No Federal recreational areas occur within this study reach. Camping was the most commonly available recreation opportunity along this study reach. Picnicking, hunting/fishing, hiking/biking, and water activities were less common. The 21 recreation areas and the activities which they provide are listed in Table 2.4-8.

Table 2.4-8

RECREATION AREAS
MISSISSIPPI RIVER: ST. PAUL - CHIPPEWA RIVER

Recreation Area	State	County	Pool	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Fort Snelling State Park	MN	Hennepin, Dakota	2	1,530	S	X	X	X	X	X
Crosby Lake Municipal Park	MN	Ramsey	2	ND	L	X	--	--	--	--
Harriet Island Municipal Park	MN	Ramsey	2	462	L	--	--	--	--	X*
Battle Creek Regional Park	MN	Ramsey	2	1,661	L	--	X	--	X	--
Hidden Falls-Crosby Farm Regional Park	MN	Dakota	2	620	L	--	X	X	X	X*
Spring Lake County Park	MN	Dakota	2	881	L	--	X	X	X	--
Lake Rebecca Municipal Park	MN	Dakota	3	ND	L	--	--	--	X	--
Levee Municipal Park	MN	Dakota	3	ND	L	ND	ND	ND	ND	ND
Point Douglas County Park	MN	Dakota	3	7	L	--	X	--	--	X
Commissary Point Campground	MN	Goodhue	3	ND	ND	X	X	--	--	--
Bay Point Park	MN	Goodhue	4	ND	ND	--	X	--	--	--
Levee Municipal Park	MN	Goodhue	4	ND	L	--	X	--	--	--
Barn Bluff Municipal Park	MN	Goodhue	4	ND	L	--	--	--	X	--
Colvill Municipal Park	MN	Goodhue	4	ND	L	X	X	--	--	X*
Frontenac State Park	MN	Goodhue	4	1,800	S	X	X	--	X	--
Hok-Si-La Municipal Park	MN	Goodhue	4	ND	L	X	--	--	X	X
Ohuta Municipal Park	MN	Wabasha	4	ND	L	--	X	--	--	--
McCahill Municipal Park	MN	Wabasha	4	ND	L	--	X	--	--	--
Roschen Park	MN	Wabasha	4	ND	ND	--	X	--	--	X*
Bay City Village Park	WI	Pierce	4	ND	L	X	--	--	--	X*
Maiden Rock Camp and Picnic Grounds	WI	Pierce	4	ND	ND	X	X	--	--	X*
Total Identified Acreage				6,961						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Located north of Frontenac, Frontenac State Park was established in 1957. Within the Frontenac area are many natural areas of interest, including the Pleasant Valley Lakelet, Wells Creek, and Lake Pepin. Wildlife inhabiting the area include golden and bald eagles during the winter, sanderling and ruddy turnstone (during migration from the Arctic and South America), and the timber rattlesnake (Minnesota DNR, 1990). Within Lake Pepin are numerous species of fish, including walleye, crappie, bluegill, northern pike, and channel catfish. Camping, picnicking, hiking, skiing, and snowmobiling are recreational opportunities available. Other areas of interest include a trail center and shelter, a scenic overlook, and an historic site.

Fort Snelling State Park, located near St. Paul, is partially within this study reach. The park provides opportunities for fishing, swimming, picnicking, camping, hiking, biking, and skiing. The Minnesota-threatened Blanding's turtle, a protected species, is found within this park.

Battle Creek Regional Park, located east of St. Paul in Ramsey County, Minnesota, provides 11 miles of hiking trails, 5 miles of biking trails, 6 miles of skiing trails, and picnic facilities.

2.4.9 Data Gaps

The NWI data covered 70 percent of this reach. The data was first extrapolated to 100 percent, then the forested wetland acreage was used to adjust the wetlands and forest data in Table 2.4-2, Land Use/Land Cover. In addition, the NWI data for emergent and shrub/scrub wetlands far exceeded the wetland acreage in the land use data. Review of the Geographic Information System (GIS) files indicated those wetland categories overlapped agricultural lands in the land use data. Therefore, the acreage for agriculture was reduced by the amounts in the two wetland categories.

2.4.10 References Cited

- Minnesota Department of Natural Resources. 1988. *Fort Snelling State Park*. Pamphlet. Explore Minnesota State Parks. St. Paul, MN.
- Minnesota Department of Natural Resources. 1990. *Frontenac State Park*. Pamphlet. St. Paul, MN.
- Minnesota Department of Natural Resources. 1992. *Public Recreation Information Map: South Metro Area*. St. Paul, MN.
- Minnesota Department of Natural Resources. 1993. *Public Recreation Information Map: Faribault*. St. Paul, MN.
- National Park Service. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance*.
- Stevens, A. 1994. *Telephone Conversation*. Wisconsin Department of Natural Resources.
- Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.
- Wisconsin Department of Natural Resources. 1989. *Rush River Delta State Park Natural Area; Fact Sheet No. 202*. Bureau of Endangered Resources. Madison, WI.

2.5 ST. CROIX RIVER

This study reach is a portion of the St. Croix River (see Figure 2-5). It is approximately 25 river miles in length, borders three counties and two states (Minnesota and Wisconsin). The reach ends where the St. Croix River enters the Mississippi River, near RM 811. Towns with a population over 5,000 are Hudson, Wisconsin and Stillwater, Minnesota. The lower section of the St. Croix River is broad except where tall bluffs constrict the river at Hudson, Afton and Kinnickinnic.

2.5.1 Soils

The soil associations that occur within this reach, and their acreage are listed in Table 2.5-1. Descriptions of the state soil associations are provided in Appendix A.

Table 2.5-1

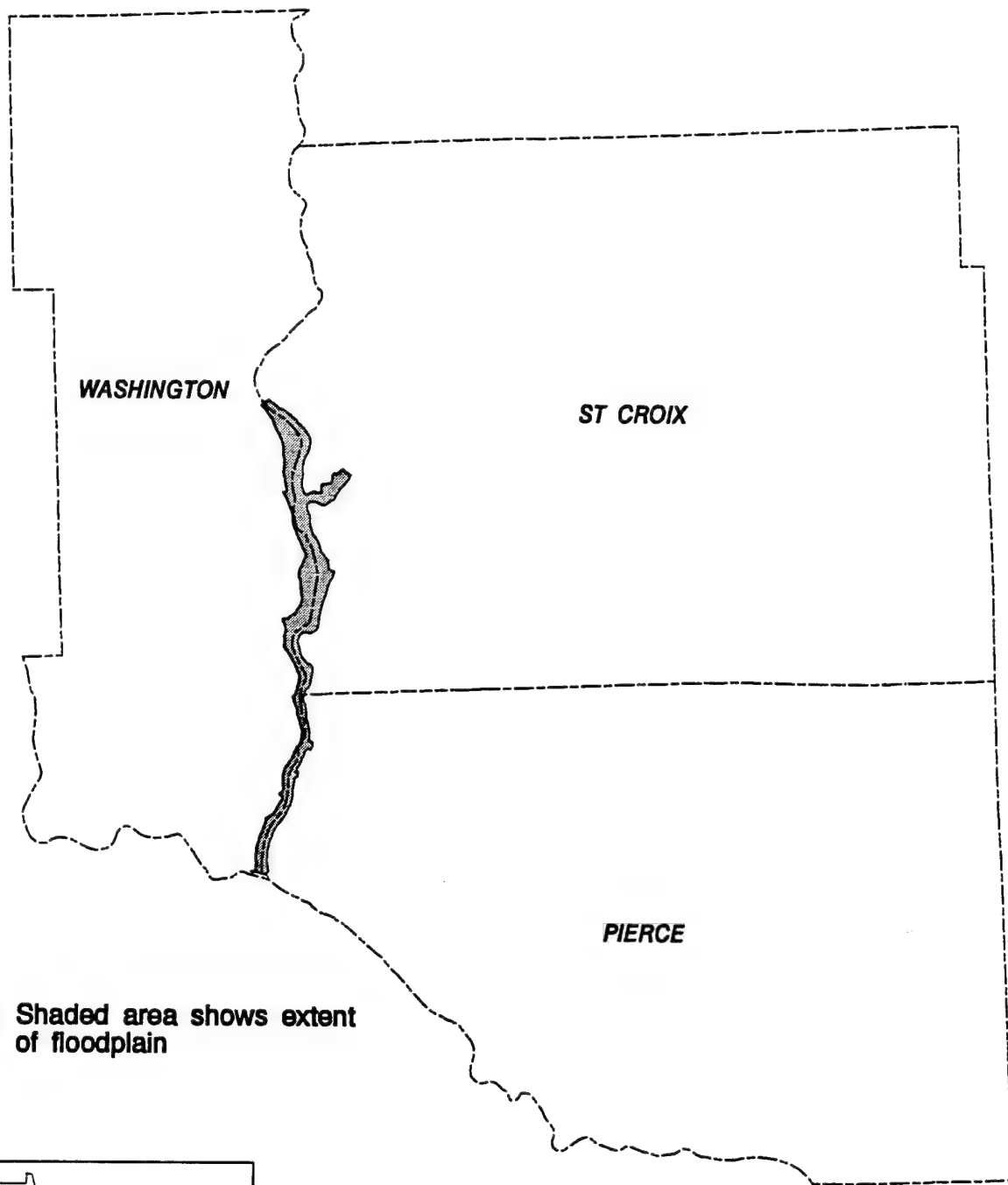
SOIL ASSOCIATIONS ST CROIX RIVER

Soil Association	State	Occurrences	Acres	Percent
ROSHOLT-CHETEK-MENAHGA	WI	11	890	28
SANTIAGO-KINGSLEY-DEMONTREVILLE	MN	1	<10	<1
ANTIGO-CHETEK-MAHTOMEDI	MN	4	1,080	34
MENAHGA-MEEHAN-FRIENDSHIP	WI	1	1,060	33
WAUKEGAN-BAYTOWN-RIPON	MN	8	130	4
MCPAUL-RADFORD-ZUMBRO	MN	1	30	<1
MCPAUL-RADFORD-ZUMBRO	WI	1	10	<1
SOIL ASSOCIATIONS SUB TOTAL	--	27	3,200	100
UNCLASSIFIED AQUATIC	ALL	1	7,790	--
SOILS AND AQUATIC TOTAL	--	--	10,990	--

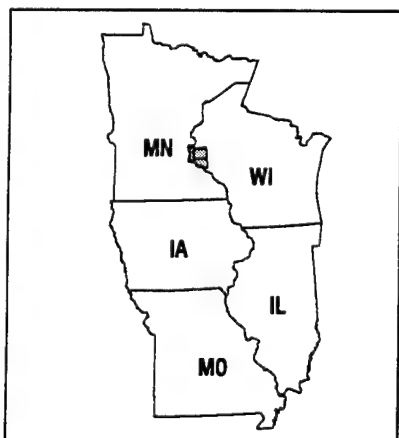
2.5.2 Land Use/Land Cover

2.5.2.1 Land Use

The floodplain of the reach encompasses 10,990 acres (Table 2.5-2). A series of small communities are found along the river; Stillwater is the largest town along the reach. A railroad line runs along the right descending bank of the river.



■ Shaded area shows extent of floodplain



Key Map



10 0 10 Miles

Figure 2-5
St. Croix River

Table 2.5-2

**LAND USE/LAND COVER
ST. CROIX RIVER**

Cover Type	Acres	Percent
Urban	1,740	16
Agriculture	1,070	10
Forest	50	< 1
Wetland*	480	4
Water	7,650	70
Barren	0	0
Total	10,990	100

*No NWI data available for forested wetland.

The lower half of the river runs through a narrow floodplain which is bounded by steep bluffs on either side. Water is the largest land use of this reach, encompassing almost three-quarters of the floodplain. The river is known as Lake St. Croix for 25 miles above the confluence with the Mississippi. The maximum width is 7,400 feet, near Hudson (NPS, 1988).

2.5.2.2 Vegetation

Forested land is along the high bluffs at the edge of the floodplain throughout the reach. The forests are a mix of hardwoods and conifers. The oak forests consist of northern red, pin, white and burr oaks. In clearings red cedar communities have become established (Minnesota DNR, 1990).

2.5.2.3 Plant Species of Special Concern

Seven plant species of special concern occur in this reach. They are found throughout the reach. Three of the Wisconsin species occur in close proximity to each other in St. Croix County, Wisconsin. The other species are scattered along the reach.

Two of the species are in Minnesota; one is endangered, the other is threatened. The species listed as endangered in Minnesota is listed as threatened in Wisconsin. The other five Wisconsin species are listed as endangered. None of the protected species are Federally listed. The plant species are listed in Table 2.5-2a.

Table 2.5-2a

**PROTECTED PLANT SPECIES
ST. CROIX RIVER**

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Brook Grass	--	--	E	St. Croix
Carolina Anemone	--	--	E	St. Croix
Dotted Blazing Star	--	--	E	St. Croix
Illinois Tick-Trefoil	--	T	--	Washington (3)
Kitten-Tails	--	E	T	Washington (3)
Prairie Plum	--	--	E	Pierce
Small Skullcap	--	--	E	Pierce

E = listed as endangered

T = listed as threatened

2.5.3 Aquatic Resources

2.5.3.1 Wetlands

According to the land use/land cover data, only 480 acres of vegetated wetland within this study reach are in the adjacent floodplain. NWI data was not available (see 2.5.9 Data Gaps).

The floodplain along the river is narrow between Prescott and Stillwater. No large islands or peninsulas and very few large wetland areas are within the study reach. The study reach is dominated by an open water riverine aquatic system. The only wetlands are located adjacent to the tributaries or lakes found within the lower portion of the St. Croix River.

2.5.3.2 Lakes and Ponds

Lake Mallalieu and Lake St. Croix are the only lakes located within the study reach. Lake Mallalieu, near the confluence of the Willow and Mississippi Rivers, is surrounded by emergent wetlands. Lake St. Croix extends from Prescott, Wisconsin to just above Stillwater, Minnesota. The total surface area of these two lakes is approximately 6,240 acres.

2.5.3.3 Tributaries

Very few tributaries empty into the St. Croix River within this particular segment. Most of these tributaries are small perennial or intermittent streams. However, two larger waterways have their confluence within the river reach. They are listed below:

Tributary	Confluence Location
Willow River	Hudson, WI
Kinnickinnic River	N. of Prescott, WI

Emergent wetlands are adjacent to each of these rivers near their confluence with the Mississippi.

2.5.4 Fisheries

Major aquatic species occurring in this reach of the St. Croix River include smallmouth bass, catfish, carp, walleye, sauger, northern pike, white bass and German brown trout near the Kinnickinnic River. Minor aquatic species in this reach include largemouth bass and muskellunge. Thirty-five species of mussels have been identified from the St. Croix River Basin (Hesse, 1993). Common species include the plain pocketbook, the threeridge, and squawfoot mussel. Minor mussel species include the threehorn wartyback, washboard, and paper pondshell.

2.5.4.1 Aquatic Species of Special Concern

Nine aquatic species with protected status are known to occur in the lower St. Croix River (Table 2.5-4). Four of these species are fish and five are mussels. The Higgins eye pearly and the winged mapleleaf mussel are the only two species with Federal protection under the Endangered Species Act. The remainder of the protected species known to occur in this reach are listed as threatened or endangered by Wisconsin. St. Croix County contains the highest number of protected species followed by Pierce County. Four of the occurrences of the Higgins' Eye Pearly Mussel and one occurrence of the winged mapleleaf mussel are known to occur in the St. Croix River just below the Willow River. The ebony/shell and purple wartyback mussels have also been observed below the Willow River. The river redhorse has been observed at three locations throughout this reach.

Table 2.5-4

**PROTECTED AQUATIC SPECIES
ST. CROIX RIVER**

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Buckhorn Mussel	--	--	T	St. Croix
Ebony Shell Mussel	--	--	E	St. Croix
Goldeye	--	--	E	Pierce
Higgin's Eye Pearly Mussel	E	E	E	St. Croix (3) Washington (3)
Pallid Shiner	--	--	E	Pierce
Purple Wartyback Mussel	--	--	E	St. Croix
River Redhorse	--	--	T	Pierce (2) St. Croix
Skipjack Herring	--	--	E	St. Croix
Winged Mapleleaf Mussel	E	--	E	St. Croix

E = listed as endangered

T = listed as threatened

2.5.4.2 Important Aquatic Habitat

The lower St. Croix River provides important habitat for numerous aquatic species. Four protected fish species occur throughout this reach (Table 2.5-4). The river redhorse, a Wisconsin state threatened species, which occurs throughout this reach, prefers pools with gravelly bottoms and areas with continuous strong flow. This species is intolerant to siltation and turbidity. The Kinnickinnic and Willow Rivers provide important habitat for not only the river redhorse, but also the skipjack herring. The Kinnickinnic River also provides important habitat for German brown trout in Wisconsin. The area below the Willow River provides important habitat for five different mussel species.

2.5.5 Wildlife

The lower St. Croix River Valley also provides diverse habitat for many species of wildlife. Major species include white-tailed deer, black bear, coyote, red fox, river otter, bald eagle, ruffed grouse, and gray partridge. Minor species include wild turkey, sharp-tailed grouse, and bobcat. Wild turkey were introduced into the area in 1989 and are now starting to populate the area (Addis, 1994).

2.5.5.1 Wildlife Species of Special Concern

The peregrine falcon, bald eagle and Blanding's turtle are the only three protected wildlife species known to occur in this reach (Table 2.5-5). The peregrine falcon and bald eagle both have Federal

protection. The peregrine falcon has been observed in Washington County south of Bayport, Minnesota. Bald eagles are known from this area year round. The Blanding's turtle has been observed in Washington County, Minnesota, north of Afton State Park.

Table 2.5-5

**PROTECTED WILDLIFE SPECIES
ST. CROIX RIVER**

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Bald Eagle	T	E	E	Washington
Blanding's Turtle	--	T	T	Washington
Peregrine Falcon	E	E	E	Washington

E = listed as endangered

T = listed as threatened

2.5.5.2 Important Wildlife Habitat

The tall bluffs along this reach near Hudson, Afton, and Kinnickinnic provide important roosting and perching habitat for peregrine falcons. Constant water flow from the Kinnickinnic and Willow Rivers provide important ice-free fishing areas for bald eagles in winter. The riparian corridor along the lower St. Croix River provides important habitat for many species of wildlife (Hesse, 1993).

2.5.6 Fish and Wildlife Management Areas

This study reach contains only one major FWMA, the state-owned Bayport WMA, south of Stillwater in Washington County. Activities found within this management area include hunting and hiking. Information about this area is provided in Table 2.5-6.

Table 2.5-6

**FISH AND WILDLIFE MANAGEMENT AREAS
ST. CROIX RIVER**

Management Areas	State	County	Type	Acres
Bayport WMA	MN	Washington	S	839

Type: Federal (F), State (S), Local (L)

ND = No Data

2.5.7 Natural Areas

The St. Croix State Natural Area is the only identified natural area along the St. Croix River (Table 2.5-7). This 85-acre, state-owned area is in Washington County near Bayport, Minnesota. It features a prairie savanna (Minnesota DNR, 1992).

Table 2.5-7

NATURAL AREAS ST. CROIX RIVER

Natural Areas	State	County	Type	Acres
St. Croix State Natural Area	MN	Washington	S	85

Type: Federal (F), State (S), Private (P) ND = No Data

2.5.8 Recreation Areas

This study reach contains five major recreation areas; the majority of these areas are in Washington County, Minnesota. State parks account for two these five recreation areas; the remaining three are locally-owned. No Federal recreation areas are found within this study reach. The St. Croix River, comprised of sandy islands, backwaters, and wooded hillsides, was the first stream in Minnesota designated as a national wild and scenic river (Minnesota DNR, 1993). "The St. Croix River National Scenic Riverway was designated in 1968 to preserve the scenic qualities of the river and to provide adequate access for recreational users" (Minnesota DNR, 1993). The five recreation areas and the activities which they provide are listed in Table 2.5-8.

Table 2.5-8

RECREATION AREAS ST. CROIX RIVER

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Afton State Park	MN	Washington	1,521	S	X	X	X	X	X
Bayport Municipal Park	MN	Washington	ND	L	ND	ND	ND	ND	ND
Lowell Park	MN	Washington	ND	L	--	X	--	X*	X*
Kinnickinnic State Park	WI	Pierce	1,242	S	X	X	X	X	X
Lakefront Park	WI	St. Croix	ND	L	--	X	--	X*	X*
Total Identified Acreage			2,763						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Located north of Prescott off Pierce County, Kinnickinnic State Park offers many different recreational opportunities, including hiking, fishing, picnicking, swimming, boat camping, cross-

country skiing, and water sports. Deer, mink, raccoons, gray and red fox, rabbits, weasels, and squirrels are common wildlife inhabiting the Kinnickinnic area. Within the park, over 140 species of birds have been identified, constituting nearly 50 percent of the nesting birds in Wisconsin, including ringneck pheasants, partridge, and waterfowl (Wisconsin DNR, 1993).

Afton State Park, south of Stillwater in Washington County, provides facilities for camping, picnicking, swimming, and fishing. Eighteen miles of hiking and skiing trails and five miles of horseback and biking trails are available.

2.5.9 Data Gaps

The NWI only covered 45 percent of the reach; therefore, the data was not used. Instead, the land use/land cover data was used instead to estimate the total acreage of wetlands.

2.5.10 References Cited

Addis, J. 1994. *Personal Communication*. Wisconsin Department of Natural Resources, Madison, WI.

Hesse, W.L. 1993. *Proceedings of the Symposium on Restoration Planning for the Rivers of the Mississippi River System*.

Minnesota Department of Natural Resources. 1992. *Public Recreation Information Map: North Metro Area*. Minneapolis, MN.

Minnesota Department of Natural Resources. 1993. *Explore Minnesota*. St. Paul, MN.

Minnesota Department of Natural Resources. 1990. *Biological Survey Map No. 1: Washington County, Minnesota*. Minnesota County Biological Study.

National Park Service. 1988. *St. Croix Riverway, National Scenic Riverway*. Wisconsin/Minnesota.

Wisconsin Department of Natural Resources. 1994. *Kinnickinnic State Park Visitor*. Madison, WI.

2.6 MISSISSIPPI RIVER: CHIPPEWA RIVER TO LOCK AND DAM 6

This reach of the Mississippi River is approximately 46 river miles in length (see Figure 2-6). It begins at RM 763 where the Chippewa River joins the Mississippi River and ends at Lock and Dam 6 (RM 717). The reach covers two states with two counties in Minnesota and two counties in Wisconsin. The major community located along the reach is Winona, Minnesota.

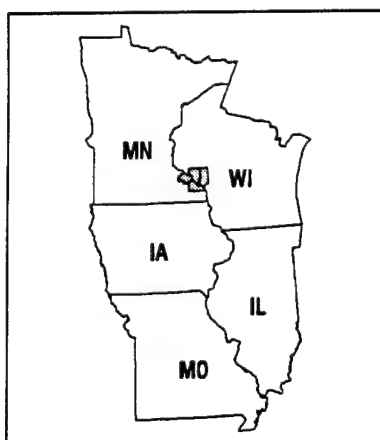
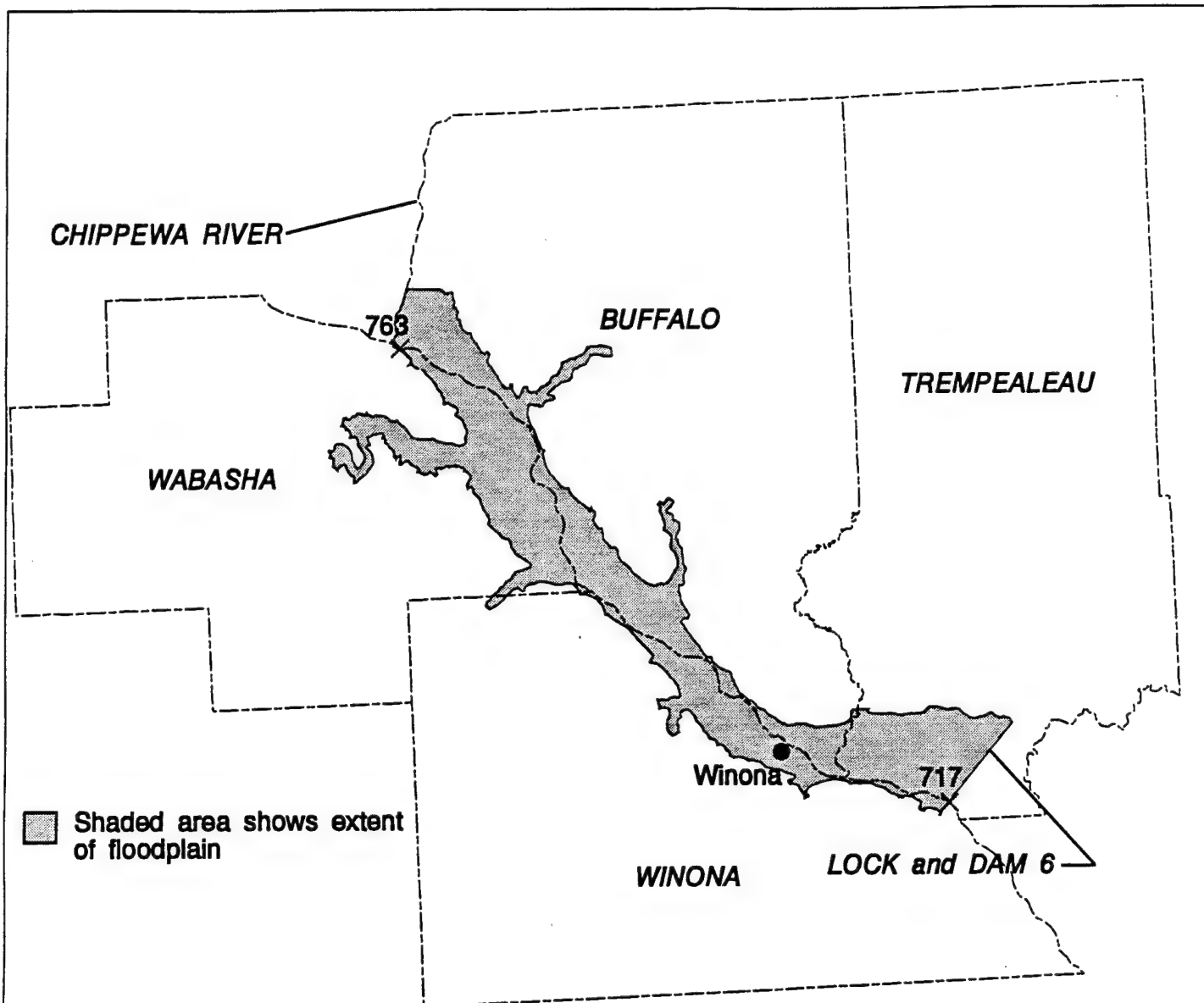
2.6.1 Soils

The soil associations that occur within this reach and the acreage within each association are listed in Table 2.6-1. Descriptions of the state soil associations are provided in Appendix A.

Table 2.6-1

SOIL ASSOCIATIONS MISSISSIPPI RIVER: CHIPPEWA RIVER - LOCK AND DAM 6

Soil Association	State	Occurrences	Acres	Percent
ABSCOTA-GLENDORA-KALMARVILLE	WI	4	15,400	14
STONY AND ROCKY LAND-SEATON-BOONE	WI	31	4,640	4
COMFREY-SHILOH	WI	3	16,150	15
COMFREY-SHILOH	MN	2	26,370	24
SPARTA-ESTHERVILLE-WAUKEGAN	MN	3	12,200	11
LACRESCENT-ELBAVILLE-LAMOILLE	MN	44	1,990	1
MINNEISKA-RAWLES-BECKER	MN	1	6,580	6
SEATON-NEWGLARUS-PALSGROVE	MN	3	20	<1
SPARTA-GOTHAM-PLAINFIELD	WI	2	10,980	10
BILLETT-CURRAN-ETTRICK	WI	2	2,410	2
CHASEBURG-PLAINFIELD-NEWALBIN	MN	2	1,470	1
SEATON-NEWALBIN-FESTINA	MN	3	1,900	2
HOUGHTON-ADRIAN-GRANBY	WI	1	880	<1
DICKINSON-DAKOTA-BILLETT	WI	2	10,220	9
SOIL ASSOCIATIONS SUB TOTAL	--	103	111,210	100
UNCLASSIFIED AQUATIC	ALL	--	19,340	--
SOILS AND AQUATIC TOTAL	--	--	130,550	--



Key Map

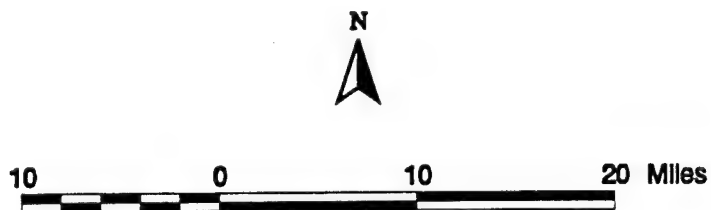


Figure 2-6
Mississippi River:
Chippewa River to Lock and Dam 6

2.6.2 Land Use/Land Cover

2.6.2.1 Land Use

The floodplain of this reach encompasses 130,550 acres (Table 2.6-2). This reach is primarily rural with scattered small communities. Winona, Minnesota is the largest town. Rail lines follow both sides of the river. The Great River Road follows the edge of the floodplain along the right descending bank.

The river is characterized by a series of wide lakes, with a narrower channel only immediately below the locks and dams. The river meanders from one side of the wide floodplain to the other. Steep bluffs are at the edge of the floodplain. Below the Chippewa River the Mississippi flows through a wide valley flanked by steep, wooded, rock bluffs on either side. Some of the bluffs reach 600 feet in height (USCOE, 1980).

Table 2.6-2

**LAND USE/LAND COVER
MISSISSIPPI RIVER: CHIPPEWA RIVER - LOCK AND DAM 6**

Cover Type	Acres	Percent
Urban	9,600	7
Agriculture	55,840	43
Upland Forest	220	< 1
Wetland*	33,450	25
Water	31,440	24
Barren	--	--
Total	130,550	100

*No NWI data available for forested wetland.

Agriculture encompasses the largest single land use in this reach. Large tracts of agricultural land are found in Buffalo and Trempealeau Counties, Wisconsin, and between the river and the Richard Dorer Memorial Forest in Minnesota.

2.6.2.2 Vegetation

Woodland in this reach is southern hardwood forest (Curtis, 1959). The small amount of upland forest is found at the edge of the Richard Dorer Memorial Forest; less than one percent of the reach is upland forest. Forested areas are primarily wetland forests found on islands in and along the river.

2.6.2.3 Plant Species of Special Concern

Five protected species occur in this reach. All but one are Wisconsin state-threatened species found in Buffalo County, Wisconsin. The rough-seeded flameflower is found in Wabash, Minnesota; it is a state endangered plant. None of the plants are Federally-listed. The plant species are listed in Table 2.6-2a.

Table 2.6-2a

PROTECTED PLANT SPECIES OF THE MISSISSIPPI RIVER CHIPPEWA RIVER - LOCK AND DAM 6

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Clustered Broomrape	--	--	T	Buffalo
Prairie Thistle	--	--	T	Buffalo (2)
Rough-Seeded Flameflower	--	E	--	Wabasha
Tubercled Orchid	--	--	T	Buffalo
White Lady's Slipper	--	--	T	Buffalo

E = listed as endangered

T = listed as threatened

2.6.3 Aquatic Resources

2.6.3.1 Wetlands

Within this reach are approximately 33,450 acres of vegetated wetland according to the land use/land cover data. The available NWI coverage was limited to less than 50 percent, insufficient for inclusion.

Vegetated wetlands mostly occur along major tributaries, on islands, or on peninsulas located throughout the river segment and within the channel of the Mississippi. The majority of the wetland area is located within the Upper Mississippi River National Wildlife and Fish Refuge (UMRNWFR). Large vegetated wetland systems are also located below (downstream) of the locks and dams within the reach.

The Upper Mississippi River WMA and the Richard J. Dorer Memorial Hardwood State Forest are located within this river segment. Within the Upper Mississippi River WMA, north of Wabasha, Minnesota, is a complex of islands containing forested wetlands.

A large concentration of emergent wetland and forested wetland is situated behind the lock at Alma, Wisconsin. A portion of this area is within the John A. Latsch State Park. Several protected plant and animal species occur in this general area, although some may not be within the floodplain. These

include: bald eagle, green dragon, button bush, Blanding's turtle, wood turtle, sandhill crane, osprey, and colonial water bird nesting sites.

A large wetland system is located along the Zumbro River. Specifically, forested wetlands line the river near its confluence with the Mississippi. Emergent wetland is also present; although to a lesser extent.

A pristine floodplain forest is located north of Winona, Minnesota. It consists primarily of forested wetland and emergent wetlands. Important plant species include button bush, muskingum sedge, Gray's sedge, and catchfly grass. Osprey, Blanding's turtle, and common moorhen are important wildlife that inhabit these wetland areas.

2.6.3.2 Lakes and Ponds

Approximately 164 individual lakes and ponds are located within the river segment. The total surface area of these lakes and ponds is approximately 5,030 acres. Many of the water bodies have small surface areas; the average size is approximately 31 acres.

As with the wetland areas, many of these water bodies are below locks and dams. These water bodies are also frequently located in association with vegetated wetlands. Several lakes and ponds are within the floodplain below the lock at Alma, Wisconsin. At least one of these water bodies is an old oxbow lake. The protected blue sucker inhabits these waters. A large lake is also present along the Buffalo River, northeast of Alma.

Near the confluence of the Mississippi River and Waumandee Creek, there are several small ponds and lakes. Below the lock at Winona, Minnesota, on the east side of the river, there are several oxbow lakes and ponds.

Robinson Lake and Peterson Lake are above Lock and Dam 4, Weavers Bottom is above Lock and Dam 5. There is also a lake adjacent to the Trempealeau National Wildlife Refuge above Lock and Dam 6.

2.6.3.3 Tributaries

Several tributaries empty into the Mississippi River within this reach. Many of these tributaries are small perennial to intermittent streams. However, there are several larger waterways that have their confluence within the study reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
Chippewa River	N. of Wabasha, MN	763
Buffalo River	N. of Alma, WI	755
Zumbro River	S. of Wabasha, MN	750
Waumandee Creek	N. of Fountain City, WI	736
Trempealeau River	Winona, MN	717

2.6.4 Fisheries

The UMRNWFR supports an abundance of aquatic life. Walleye, sauger, white bass, bluegill, black crappie, northern pike, and smallmouth bass are all common in this reach. Minor species include largemouth bass, white crappie, and bullhead catfish. Carp, small and bigmouth buffalo, drum and channel catfish are important species to the commercial fishery.

This reach also supports various species of mussels. The threeridge, pimple back, pigtoe, mapleleaf, and hickory nut mussels are common in this reach. Minor species of mussels in this reach includes the purple pimpleback, ebonyshell, and purple pocketbook. In Minnesota, the only mussel species legal to harvest is the threeridge mussel.

2.6.4.1 Aquatic Species of Special Concern

Eleven aquatic species with protected status occur in this reach of the Mississippi River. Nine of these species are fish, one is a mussel, and one is a snail (see Table 2.6-4). None of these species have Federal protection nor are any of the eleven species listed as threatened or endangered in Minnesota. Pool 5 contains the most occurrences of protected species followed by Pool 5A. The river redhorse occurs in every pool in this reach except Pool 4.

Table 2.6-4

**PROTECTED AQUATIC SPECIES IN THE MISSISSIPPI RIVER
CHIPPEWA RIVER - LOCK AND DAM 6**

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Black Buffalo	--	--	T	Buffalo(3), Trempealeau
Blue Sucker	--	--	T	Buffalo(4), Trempealeau
Crystal Darter	--	--	E	Buffalo, Trempealeau
Goldeye	--	--	E	Buffalo(4), Trempealeau
Greater Redhorse	--	--	T	Trempealeau
Monkeyface Mussel	--	--	T	Buffalo
Paddlefish	--	--	T	Buffalo(2)
Pallid Shiner	--	--	E	Buffalo(3)
River Redhorse	--	--	T	Buffalo(3)
Speckled Chub	--	--	T	Buffalo, Trempealeau
Wing Snaggletooth (Snail)	--	--	T	Trempealeau

E = listed as endangered

T = listed as threatened

2.6.4.2 Important Aquatic Habitat

Important habitat include three important tailwater areas, several lake-type habitat areas, and numerous backwater areas. The areas just below the locks and dams in this reach provide the most important habitat in each pool.

The area below Alma, Wisconsin, in Pool 5 provides important habitat for the goldeye, river redhorse, and crystal darter, which are all state-listed in Wisconsin. The black buffalo, goldeye, and river redhorse have all been observed in Pool 5A above Winona, Minnesota.

The Finger Lakes area below Lock and Dam 4 provides important spawning and rearing habitat for walleye and largemouth bass. Polander Lake, Big Lake, Weaver Bottoms, Robinson Lake and Peterson Lake in this reach provide important habitat for various aquatic species.

2.6.5 Wildlife

Numerous backwater areas, interspersed with forested islands, provide habitat for wildlife species. Major species include white-tailed deer, coyote, red fox, raccoon, beaver, muskrat, river otter, cottontail rabbit, and ruffed grouse. Minor species include opossum, bobcat, bobwhite quail, and ring-necked pheasant.

The reach provides important habitat for migrating bald eagles and waterfowl. Major waterfowl species include Canada goose, mallard, wood duck, and blue-winged teal. Minor waterfowl species include canvasback and redhead ducks and white-fronted geese.

2.6.5.1 Wildlife Species of Special Concern

Six wildlife species with protected status occur in this reach. Two of these species are birds, three are reptiles and one is an insect (Table 2.6-5). The peregrine falcon and bald eagle are the only two species with Federal protection under the Endangered Species Act. The bald eagle is Federally listed as threatened in Wisconsin and Minnesota. The other protected species are listed as endangered or threatened in Minnesota and/or Wisconsin.

Table 2.6-5

PROTECTED WILDLIFE SPECIES OF THE MISSISSIPPI RIVER CHIPPEWA RIVER - LOCK AND DAM 6

Species	Federal Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Bald Eagle	T	T	T	Wabasha(5), Winona
Blanding's Turtle	—	T	T	Wabasha(12), Winona(3), Buffalo
Eastern Massasauga Rattlesnake	—	—	E	Buffalo(3)
Ottoe Skipper Butterfly	—	T	—	Wabasha
Peregrine Falcon	E	E	E	Buffalo
Wood Turtle	—	T	E	Wabasha(2)

E = listed as endangered

T = listed as threatened

The highest number of protected wildlife species occur in Pool 5, followed by Pool 4. Thirteen occurrences of the Blanding's turtle have been reported within Pool 5 near the McCarthy Lake WMA. Three occurrences of the eastern massasauga rattlesnake have been reported within Pool 4 near the Chippewa River.

2.6.5.2 Important Wildlife Habitat

The Trempealeau National Wildlife Refuge located in Pool 6, provides significant isolated wetlands for bald eagles, furbearers, and many species of waterfowl. This refuge is separated from the Mississippi River by an old set of railroad tracks. This set of railroad tracks has worked as a barrier to protect the refuge and associated wetlands from pollution and siltation. At over 5,000 acres, this refuge provides important habitat as a resting and breeding ground for migratory birds and other wildlife.

The UMRNWFR provides high quality wildlife habitat in this reach. Backwater areas and lake type habitats provide important habitat for bald eagles and millions of waterfowl each year. The Nelson Trevino Research Natural Area near the Chippewa River in Pool 4 contains important habitat for eastern massasauga rattlesnakes, wood ducks, bald eagles, and great egrets. In Pool 5, the backwater areas of Weaver Bottoms and Belvidere Slough provide important habitats for canvasback ducks, common moorhens, and Forster's terns. Diverse wetlands in the McCarthy Lake WMA in Pool 5 provide important habitat for the ottoe skipper butterfly, wood turtle, and box turtle. The Whiteman State Wildlife Area in Pool 5A provides important habitat for all species of wildlife including the peregrine falcon.

2.6.6 Fish and Wildlife Management Areas

This study reach contains seven major FWMAs, the majority of which are found in Minnesota. Federal wildlife refuges account for two of the seven FWMA; the remaining five areas are state-owned. All of the pools found within this study reach provide good habitat for fish and wildlife, especially Lake Pepin, Weaver Bottoms, Belvidere Slough, and the Fountain City Bay area (USCOE, 1980). The seven management areas are listed by state in Table 2.6-6; acreage of each is also provided, where available.

Table 2.6-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MISSISSIPPI RIVER: CHIPPEWA RIVER - LOCK AND DAM 6**

Management Areas	State	County	Pool	Type	Acres
UMRNWFR	MN, WI	All	4-6	F	200,000**
Whitewater State WMA	MN	Wabasha, Winona	5	S	27,499
McCarthy Lake Wildlife Area	MN	Wabasha	5	ND	2,849
Thorpe WMA	MN	Winona	5a	ND	95
Agahming Wildlife Refuge	MN	Winona	6	ND	ND
Whitman Dam Wildlife Area	WI	Buffalo	5	ND	ND
Trempealeau National Wildlife Refuge	WI	Trempealeau	6	F	ND
Total Identified Acreage					30,348

**Acreage shown is total, amount in reach is unknown.

Type: Federal (F), State (S), Local (L) ND = No Data

The UMRNWFR, a 200,000-acre refuge which covers portions of Minnesota, Wisconsin, and Illinois, covers part of this study reach. The reach contains only portions of the total area of the refuge, at Lake Pepin in Pool 4. Throughout the 264-mile long refuge are nesting colonies of many great blue heron and great egrets. The UMRNWFR contains habitat for protected species such as river otters, heron rookeries, double-crested cormorants, great egrets, and bald eagles. Wildlife observation, hiking, swimming, boating, camping, picnicking, fishing, and photography are possible activities in this refuge (Riley and Riley, 1992).

The Trempealeau National Wildlife Refuge (Trempealeau), northeast of Winona in Trempealeau County, was established by Franklin D. Roosevelt in 1936. Sand prairie, marsh, and hardwood forest flourish throughout the Trempealeau area. Trempealeau contains habitat suitable for diverse wildlife such as migratory eagles, waterfowl, bluebirds, warblers, beavers, and white-tailed deer (Riley and Riley, 1992). Black terns, wood ducks, eagles, ospreys, great blue herons, and great egrets, double-crested cormorants, warblers, Indigo buntings, northern orioles, bluebirds, and northern harriers inhabit the refuge (Riley and Riley, 1992).

2.6.7 Natural Areas

This study reach contains five natural areas. Features include grassland ecosystems, prairie and large relatively undisturbed floodplain forests. Chippewa River Bottoms in Wisconsin, is designated as a

National Natural Landmark (NPS, 1994). The natural areas are listed by state in Table 2.6-7; acreage and approximate location by river pool and county are also provided.

Table 2.6-7

NATURAL AREAS
MISSISSIPPI RIVER: CHIPPEWA RIVER - LOCK AND DAM 6

Natural Areas	State	County	Pool	Type	Acres
Kellogg-Weaver Dunes State Natural Area	MN	Wabasha	5	S	697
Upper and Lower McNally Landing Natural Area	MN	Winona	5A	F	--
Nelson-Trevino Bottoms State Natural Area	WI	Buffalo	4	F	3672
Chippewa River Bottoms	WI	Buffalo	4	F/S	--
Whitman Bottoms Floodplain Forest State Natural Area	WI	Buffalo	5A	--	154
Total Identified Acreage					4,523

Type: Federal (F), State (S), Private (P) ND = No Data

Minnesota has two natural areas. Kellogg-Weaver Dunes, near Buffalo City, is a significant grassland ecosystem. The area is used in the recovery effort for a Federally-endangered raptor. The Upper and Lower McNally Landing Natural Area is a USCOE-owned site near Winona. This native prairie area has value to local educational institutions (USCOE, 1983; USFWS, 1987).

Three areas were identified in Wisconsin. The Nelson-Trevino Research Natural Area and the Chippewa River Bottoms National Natural Landmark are located at the confluence of the Chippewa River. The Nelson-Trevino Research Natural Area is a cooperative venture between the USCOE and the USFWS. Oxbows, marshes and sloughs are found in what is described as one of the least altered floodplain forests in the midwest (USFWS, 1987; Wisconsin DNR, 1991). This large remote delta area serves as a waterfowl sanctuary, a wood duck production area and walleye spawning area. It also provides habitat to a state-threatened bird and state-endangered reptiles and amphibians (USFWS, 1987; Wisconsin DNR, 1991). The Chippewa River Bottoms Natural Area is jointly owned by the Federal and state government. This national natural landmark features the largest single stand of post-glacial bottomland hardwood forest within the region (NPS, 1994). A 500-nest heron and egret rookery serves as a study area.

The Whitman Bottoms Floodplain Forest is northwest of Merrick State Park. Seven species of cavity nesting woodpeckers are found in the forest. Indian Creek meanders through the area; 62 species of fish have been identified (USFWS, 1987; WDNR, 1989). It contains mature floodplain forest, a heron rookery and habitat for threatened birds and endangered fish species (USFWS, 1987; USCOE, 1983).

2.6.8 Recreation Areas

This study reach contains nine major recreation areas. State parks and forests account for four of the nine recreation areas; the remaining five are locally-owned. No Federal recreation areas occur within this study reach. Camping and picnicking activities are the most commonly available recreational opportunities within the study reach. Hunting/fishing, hiking/biking, and water activities are not as available. Pool 5 and 6 contain the majority of recreation areas within this reach, with 3 each. Only a portion of Pool 4 is included in this segment, between Lock and Dam 3 and the confluence of the Mississippi and Chippewa Rivers. Excluding Pool 4, this reach includes 542 camping units, 624 picnicking units, and 29 boat accesses (USCOE, 1980). The nine recreation areas and the activities which they provide are listed in Table 2.6-8.

Table 2.6-8

RECREATION AREAS MISSISSIPPI RIVER: CHIPPEWA RIVER - LOCK AND DAM 6

Recreation Area	State	County	Pool	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Wabasha Municipal Park	MN	Wabasha	4	ND	L	X	X	--	--	X
Richard J. Dorer Memorial State Forest	MN	Wabasha	5	43,000	S	--	--	X	--	--
John Latsch State Park	MN	Winona	5	336	S	--	--	--	--	--
Latsch Prairie Island Park	MN	Winona	6	ND	L	X	X	--	--	--
Levee Park	MN	Winona	6	ND	L	ND	ND	ND	ND	ND
Riecks Lake Public Recreation Area	WI	Buffalo	4	ND	L	X	X	--	--	--
Buena Vista Park	WI	Buffalo	5	ND	L	--	X	--	--	--
Merrick State Park	WI	Buffalo	5a	322	S	X	X	X	X	X*
Perrot State Park	WI	Trempealeau	6	3,763	S	X	X	X	X	X
Total Identified Acreage				47,421						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Merrick State Park, located northwest of the town of Fountain City in Buffalo County, was donated by John A. Latsch in 1919 and dedicated to George Byron Merrick in 1932. Wildlife inhabiting the park include great blue heron, great egrets, ducks, muskrats, kingfishers, and otters. Camping and swimming are the most common activities, with boat ramps, showers, playground equipment, and firewood are available (Wisconsin DNR, 1993).

Perrot State Park, east of Trempealeau in Trempealeau County, Wisconsin contains a portion of the Great River Trail, a 24-mile trail beginning near Trempealeau National Wildlife Refuge. Plant species found throughout the marsh, prairies, valleys, and wooded slopes include violets, hepaticas, Dutchman's breeches, woodland phlox, wood geraniums, bellworts, and ferns. Many mammals also inhabit the park, including mink, deer, beaver, muskrats, raccoons, woodchucks, fox, and chipmunks. Warblers, vireos, thrushes, flycatchers, waterfowl, wading birds, shorebirds, and hawks migrate through the Perrot area during spring and fall (Wisconsin DNR, 1993).

2.6.9 Data Gaps

The NWI data covered less than 50 percent of the reach. This amount was not sufficient to establish a reliable pattern for the rest of the reach, and therefore was not included in the report. Rather, the wetland acreage from the land use/land cover was used, since there was 100 percent coverage for this data.

2.6.10 References Cited

- Curtis, John T. 1959. *The Vegetation of Wisconsin*. The University of Wisconsin Press, Madison, WI.
- National Park Service, Sept. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance*.
- Riley, L. and Riley, W. 1993. *Guide to the National Wildlife Refuges*. MacMillan Publishing Company. New York, NY.
- U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service (in conjunction with state and local agencies). 1980. *A Study of the Upper Mississippi River - Great River Environmental Action Team (GREAT I)*. St. Paul, MN.
- U.S. Army Corps of Engineers. 1983. *Upper Mississippi River Land Use Allocation Plan; Master Plan for Public Use Development and Resource Management Part I and Part II*. St. Paul, MN.
- U.S. Department of the Interior. 1992. *The Upper Mississippi River Wildlife and Fish Refuge, Pools 4-14*. Maps. Washington, D.C.
- U.S. Fish and Wildlife Service. 1987. *Resource Classification System; Upper Mississippi River National Wildlife and Fish Refuge*.
- Wisconsin Department of Natural Resources. 1989. *Whitman Bottoms Floodplain Forest State Natural Area. Fact Sheet No. 173*. Bureau of Endangered Resources, Madison, WI.
- Wisconsin Department of Natural Resources. 1991. *Nelson-Trevino Bottoms State Natural Area. Fact Sheet No. 81*. Madison, WI.
- Wisconsin Department of Natural Resources. 1993. *Perrot State Park Visitor*. Madison, WI.
- Wisconsin Department of Natural Resources. 1994. *Merrick State Park Visitor*. Madison, WI.

2.7 BLACK RIVER

This study reach consists of the Black River in Wisconsin from Black River Falls to the Mississippi (see Figure 2-7). It is approximately 45 river miles in length and covers four counties. It ends where the Black River joins the Mississippi, near RM 711. This reach traverses an area that is predominantly rural. The city of LaCrosse, Wisconsin is approximately 10 miles south of the confluence of the Black River and the Mississippi.

2.7.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.7-1. Descriptions of the state soil associations are provided in Appendix A.

Table 2.7-1

SOIL ASSOCIATIONS BLACK RIVER

Soil Association	State	Occurrences	Acres	Percent
SEATON-GALE-TELL	WI	8	2,780	15
ABSCOTA-GLENDORA-KALMARVILLE	WI	1	12,320	70
BOONE-TARR-IMPACT	WI	6	2,550	14
SPARTA-GOTHAM-PLAINFIELD	WI	2	10	<1
SOIL ASSOCIATIONS SUB TOTAL	--	17	17,660	100
UNCLASSIFIED AQUATIC	ALL	--	0	--
SOILS AND AQUATIC TOTAL	--	--	17,660	--

2.7.2 Land Use/Land Cover

2.7.2.1 Land Use

The total area of floodplain within this reach covers 17,660 acres (Table 2.7-2). The northern end of the reach passes through Black River Falls, Wisconsin. The remainder of the reach is rural with scattered small communities.

The reach is characterized by a wide floodplain with a narrow river channel. The river meanders within the floodplain. The river is a continuous series of tight meanders. The river widens along the Monroe and Jackson County Line.



 Shaded area shows extent of floodplain



Key Map



Figure 2-7

Black River

Table 2.7-2

**LAND USE/LAND COVER
BLACK RIVER**

Cover Type	Acres	Percent
Urban	220	1
Agriculture	6,330	35
Upland Forest	80	< 1
Wetland*	10,120	57
Water	910	5
Total	17,660	100

*No NWI data available for forested wetland.

2.7.2.2 Vegetation

The limited amount of forest land is distributed evenly along the reach. The largest concentration of forest land is at the confluence with the Mississippi. The majority of the reach is in the Oak Savanna ecological region, a mixture of prairie grasses and oaks. A small section of southern-hardwood forest is in eastern Trempealeau County (Curtis, 1959).

2.7.2.3 Plant Species of Special Concern

No plant species of special concern are known to be in this reach.

2.7.3 Aquatic Resources**2.7.3.1 Wetlands**

Within this study reach, approximately 12,000 acres of vegetated wetland are in the adjacent floodplain. This data was extracted from land use coverage calculations provided by Landsat since no NWI data was available for the study reach.

Large wetland habitats are evenly distributed throughout the floodplain of the Black River. A review of available data indicates that most non-agriculture lands within the study reach are wetlands. Near the confluence of the Black River and the Mississippi River is an extremely large wetland complex. This area is likely the result of continual backwater and headwater flooding events.

2.7.3.2 Lakes and Ponds

Approximately 124 individual lakes and ponds are located within the river segment. The total surface area of these lakes and ponds is approximately 1,364 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is approximately 11 acres. As with the wetland

areas, these water bodies appear to be evenly distributed throughout the study reach. Horseshoe Lake located east of Melrose is a relatively large oxbow lake.

2.7.3.3 Tributaries

A few perennial and intermittent tributaries empty into the Black River within this particular segment. Many of these tributaries are small streams. However, three larger water ways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Beaver Creek	N. of Holmen, WI
Fleming Creek	E. of Galesville, WI
Big Creek	N. of Cataract, WI

At the confluence of the Black River and Beaver Creek, is a large concentration of wetlands. The pallid sturgeon and river sturgeon inhabit the waters of these two streams.

2.7.4 Fisheries

The Black River is an important warmwater stream flowing through the state of Wisconsin. Major species include muskie, from Black River Falls down to North Bend, walleye, smallmouth bass, northern pike, and channel and flathead catfish. Minor species include largemouth bass, white bass, and yellow perch. Species important to the commercial fishery include carp, buffalo, and drum (Kohlmeyer, 1994).

2.7.4.1 Aquatic Species of Special Concern

Three aquatic species with protected status occur in this reach of the Black River (Table 2.7-4). The river redhorse and pallid shiner have been observed near the Mississippi River in LaCrosse and Trempealeau County, respectively. The blue sucker has been observed in the Black River upstream of North Bend, Wisconsin.

Table 2.7-4

**PROTECTED AQUATIC SPECIES
BLACK RIVER**

Species	Federal Status	Wisconsin Status	Site Occurrences by County
Blue Sucker	--	T	Jackson
Pallid Shiner	--	E	LaCrosse
River Redhorse	--	T	Trempealeau

E = listed as endangered

T = listed as threatened

2.7.4.2 Important Aquatic Habitat

Important habitat for aquatic species occurs throughout the Black River, notably, the mouths of Beaver and Fleming Creeks provide important habitat for muskie, walleye, and other predatory aquatic species. The clear, swift pools with gravelly bottoms near New Amsterdam and North Bend provide important habitat for the river redhorse, pallid shiner, and blue sucker.

2.7.5 Wildlife

Major species of wildlife along the Black River include white-tailed deer, wild turkey, beaver, river otter, raccoon, red and gray fox, and coyote. Minor species include black bear and bobcat. The bald eagle is a common transient through the Black River during migration. Once the Black River freezes over, the bald eagle is noticed more often near the Mississippi River.

2.7.5.1 Wildlife Species of Special Concern

The bald eagle is the only protected wildlife species known to occur in this reach (Table 2.7-5). The bald eagle is Federally-listed as threatened in Wisconsin and has been observed throughout this reach of the Black River.

Table 2.7-5

**PROTECTED WILDLIFE SPECIES
BLACK RIVER**

Species	Federal Status	Wisconsin Status	Site Occurrences by County
Bald Eagle	T	T	All counties

E = listed as endangered

T = listed as threatened

2.7.5.2 Important Wildlife Habitat

Wetlands along the Black River provide important habitat for many species of migrating waterfowl and other wildlife species. The riparian corridor along the Black River provides important roost trees for bald eagles and cover for other species of wildlife. The North Bend wildlife area near North Bend, Wisconsin, provides about 1,800 acres of bottomland hardwood habitat important to many species of wildlife including wild turkeys, ruffed grouse, bald eagles, and white-tailed deer.

2.7.6 Fish and Wildlife Management Areas

No fish and wildlife management areas were found in this study reach.

2.7.7 Natural Areas

No listed natural areas are within this study reach. The Black River Bottoms Natural Area and Van Loon Natural Area occur within the Mississippi River floodplain at the confluence of the Black River; these areas are discussed in Section 2.8.7.

2.7.8 Recreation Areas

No recreation areas were found in this study reach.

2.7.9 Data Gaps

No NWI data was available for this reach. Wetland acreage was taken from the land use/land cover data. The description was based on review of USGS and state maps.

2.7.10 References Cited

Curtis, John T. 1959. *The Vegetation of Wisconsin*. The University of Wisconsin Press, Madison, WI.

Kohlmeyer, G. 1994. *Telephone Conversation*. Black River State Forest. Black River Falls, WI.

2.8 MISSISSIPPI RIVER: LOCK AND DAM 6 TO GUTTENBERG, IOWA

This study reach of the Mississippi River is approximately 103 river miles in length (see Figure 2-8). It begins at Lock and Dam 6 (RM 717) and ends at RM 614 below Guttenberg, Iowa. The reach passes through nine counties in Minnesota, Wisconsin and Iowa. LaCrosse, Wisconsin and Guttenberg, Iowa, are the major communities along this reach. The Black, Root and Wisconsin Rivers are the primary tributaries entering the Mississippi River along this reach.

2.8.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.8-1. Descriptions of the state soil associations are provided in Appendix A.

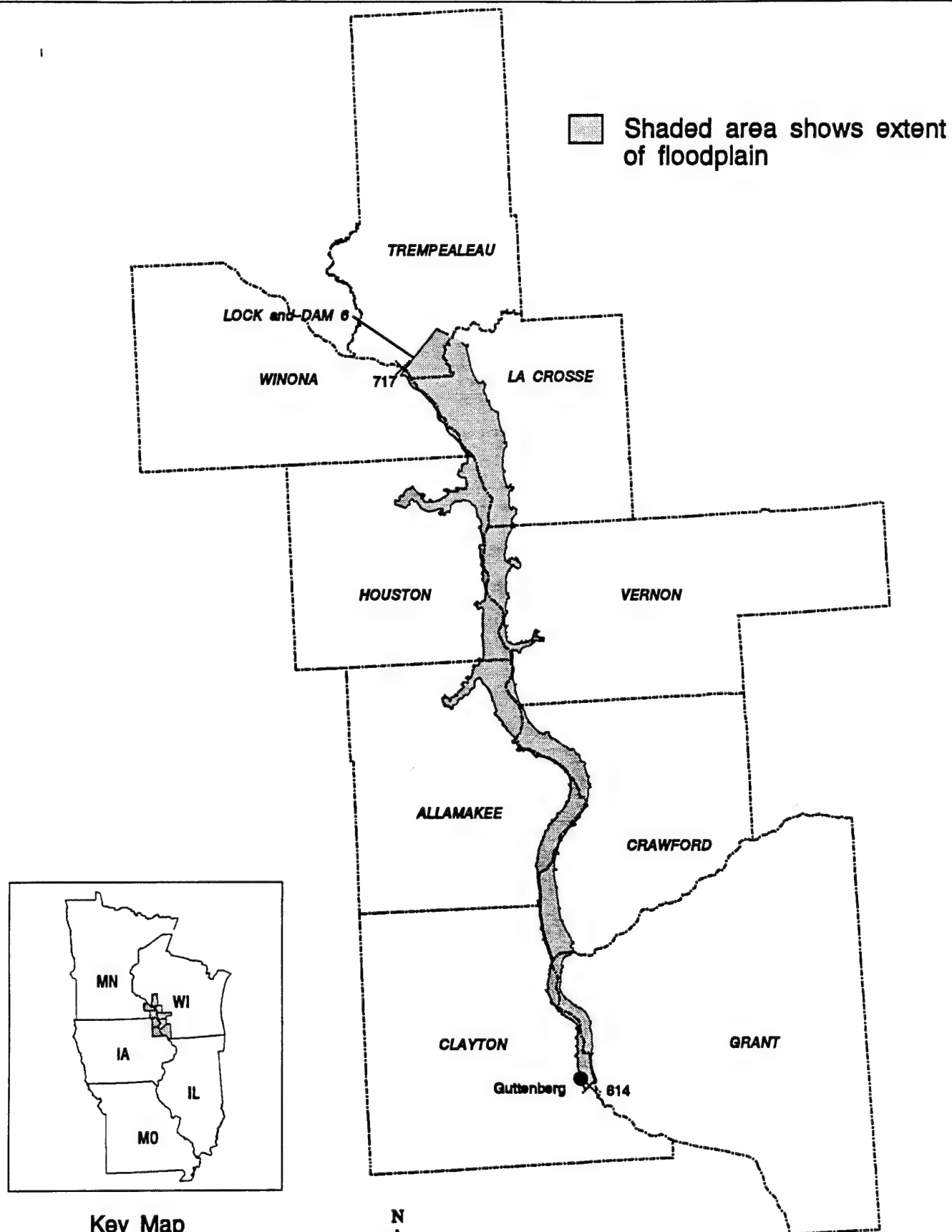


Figure 2-8
Mississippi River:
Lock and Dam 6 to Guttenberg, Iowa

Table 2.8-1

**SOIL ASSOCIATIONS
MISSISSIPPI RIVER: LOCK AND DAM 6 - GUTTENBERG**

Soil Association	State	Occurrences	Acres	Percent
ABSCOTA-GLENDORA-KALMARVILLE	WI	4	17,540	11
BILLETT-CURRAN-ETTRICK	WI	6	3,650	2
SEATON-GALE-TELL	WI	1	10	<1
DICKINSON-DAKOTA-BILLETT	WI	3	9,530	6
SPARTA-GOTHAM-PLAINFIELD	WI	6	26,150	17
LA.FARGE-URNE-NORDEN	WI	35	2,590	2
COMFREY-SHILOH	WI	2	13,470	9
LACRESCENT-ELBAVILLE-LAMOILLE	MN	27	1,650	1
SEATON-NEWALBIN-FESTINA	MN	7	1,980	1
COMFREY-SHILOH	MN	1	8,020	5
MOUNDPRAIRIE-KALMARVILLE-RAWLES	MN	1	7,070	5
PLAINFIELD-RAWLES-MINNEISKA	MN	1	40	<1
DORCHESTER-CHASEBURG-COLO	MN	1	10,630	7
DORCHESTER-CHASEBURG-COLO	WI	4	25,100	16
DORCHESTER-CHASEBURG-COLO	IA	5	26,130	17
LACRESCENT-ELBAVILLE-LAMOILLE	IA	16	710	<1
CHELSEA-EMELINE-LAMONT	IA	3	760	<1
STONY AND ROCKY LAND-VALTON-FAYETTE	WI	17	760	<1
FAYETTE-NORDNESS-ROCK OUTCROP	IA	9	620	<1
SOIL ASSOCIATIONS SUB TOTAL	--	149	156,410	100
UNCLASSIFIED AQUATIC	ALL	5	55,870	--
SOILS AND AQUATIC TOTAL	--	--	212,280	--

2.8.2 Land Use/Land Cover

2.8.2.1 Land Use

The total area of the floodplain within this reach covers 212,280 acres (Table 2.8-2). The area is primarily rural with scattered small communities along the river banks. Two urban areas are along the river: LaCrosse and Prairie du Chien, Wisconsin. Railroad lines are along both sides of the river. Roads on both the right and left descending banks of the river are designated as the Great River Road, the nation's longest scenic byway (NPS, 1994). Industrial uses along the river are primarily in the vicinity of LaCrosse and Prairie du Chien. These industries include shipping and storage facilities, grain elevators, and power companies. Some large islands have been developed as residential areas: the southern end of French Island near LaCrosse, an island near Prairie du Chien and an island north of Guttenberg. The LaCrosse Municipal Airport is at the north end of French Island.

Table 2.8-2

LAND USE/LAND COVER MISSISSIPPI RIVER: LOCK AND DAM 6 - GUTTENBERG

Cover Type	Acres	Percent
Urban	25,480	12
Agriculture	56,030	26
Upland Forest	410	< 1
Wetland*	59,770	28
Water	70,590	33
Barren	0	--
Total	212,280	100

*No NWI data available for forested wetland.

This reach is characterized by large lakes created by the locks and dams alternating with a narrower river channel below each dam. Below the dams the river narrows flowing through a maze of wetlands. The channel becomes narrower and has a more consistent width below Prairie du Chien. Agricultural land is found on the higher, outer edges of the floodplain.

2.8.2.2 Vegetation

Forest land in this reach is primarily forested wetlands. Less than one percent of forest is found on uplands. Oak savanna is the predominant plant community on the right descending bank of the river (Curtis, 1959). This mixed community consists of oaks and bluestem grasses. The northern floodplain forest, a mix of poplars, willows, and elm is found on the left descending bank (Küchler, 1975). The forested wetlands are found on islands or protrusions of land into the river.

2.8.2.3 Plant Species of Special Concern

Of the sixteen protected plant species along this reach (Table 2.8-2a) only two are Federally protected. The reniform sullivantia is Federally listed as endangered and the northern monkshood is Federally listed as threatened. The others are designated for state protection by Iowa, Minnesota and/or Wisconsin.

Two species, the reniform sullivantia and purslane, are found in Winona County, Minnesota. The Illinois tick-trefoil has been observed in the State Forest west of Reno Village in Houston County, Minnesota. Sweet-smelling indian-plantain is found within the floodplain forest in the Upper Mississippi Fish and Wildlife Refuge in Houston County, Minnesota.

Six of the species including the Federally-listed northern monkshood are listed as threatened in Wisconsin. Three species are listed as endangered in the state of Wisconsin.

Table 2.8-2a

**PROTECTED PLANT SPECIES OF THE MISSISSIPPI RIVER
LOCK AND DAM 6 - GUTTENBERG**

Species	Federal Status	Iowa Status	Minnesota Status	Wisconsin Status	Site Occurrences by County
Black Holly	--	E	--	--	Allamakee
Hairy Meadow Parsnip	--	--	--	E	Crawford
Illinois Tick-Trefoil	--	--	T	--	Houston (2)
Northern Monkshood	T	T	--	T	Vernon
Pale Purple Coneflower	--	--	--	T	Grant
Prairie Milkweed	--	--	--	T	LaCrosse
Purple Milkweed	--	--	--	E	Grant (3)
Purple Cliff-Brake	--	E	T	--	Houston (2)
Purslane	--	--	E	--	Winona
Reniform Sullivantia	E	--	--	--	Winona (2)
Rock Clubmass	--	T	T	--	Houston
Sweet-Smelling Indian-Plantain	--	--	E	--	Houston
Tubercled Orchid	--	--	T	T	LaCrosse (3)
Wild Petunia	--	--	E	E	Crawford(2)
Yellow Gentian	--	--	--	T	Grant
Yellow Giant Hyssop	--	--	--	T	Crawford Grant (3)

E = listed as endangered

T = listed as threatened

2.8.3 Aquatic Resources

2.8.3.1 Wetlands

Within this reach are approximately 59,740 acres of vegetated wetland, according to the land use/land cover data. The NWI coverage was insufficient for this reach.

Vegetated wetlands are largely associated with isolated islands or peninsulas located along the river segment and within the channel of the Mississippi. Large vegetated wetland systems are also below (downstream) the several locks and dams found along the river segment.

South of La Crosse, Wisconsin, is a large wetland complex. The area contains approximately 4,000 acres of emergent wetland and 3,000 acres of forested wetland near the confluence of the Mississippi and Root Rivers. Some of this wetland is in the Richard J. Dorer Memorial State Forest in Minnesota. The forest contains pristine floodplain forests and colonial waterbird nesting sites. The bald eagle and peregrine falcon have been reported in the forest.

North of Lansing, Iowa, near the Iowa-Minnesota border, is another large wetland system. This ecosystem is located below Lock and Dam No. 8 at the confluence of the Bad Axe River and the Upper Iowa River. This area contains approximately 11,000 acres of forested and 1,500 acres of emergent wetland.

A large concentration of forested wetland is below Lock and Dam No. 9, north of Prairie du Chien, Wisconsin. This wetland area is near the Yellow River State Forest. The mudpuppy, a protected species in the state of Iowa, is in this wetland area. Several islands containing forested wetland are just north of Clayton, Iowa. The wetlands are found exclusively on the left descending side of the River.

2.8.3.2 Lakes and Ponds

Approximately 313 individual lakes and ponds are within the study reach. The total surface area of these lakes and ponds is approximately 7,110 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is approximately 23 acres.

As with the wetland areas, many of these water bodies are below locks and dams. These water bodies are also frequently located in association with vegetated wetlands. Several lakes and ponds are within the floodplain between La Crosse, Wisconsin and Lansing, Iowa. North of Clinton, Iowa, on the Iowa side of the river, several small ponds are interspersed within a complex of islands. Across from Clinton, Iowa, on the Wisconsin side of the river, are nine large pools.

The lakes encompass the floodplain between the bluffs, stretching to five miles wide in some places. The large lakes include Lake Onalaska which extends above Lock and Dam 7 at LaCrosse to RM 709, the lake which extends from RM 680 to RM 690, and Lake Winneshiek which is above Lock and Dam 9, between RM 648 and RM 661.

2.8.3.3 Tributaries

Several tributaries empty into the Mississippi River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
La Crosse River	La Crosse, WI	698
Root River	La Crosse, WI	694
Bad Axe River	N. of Lansing, IA	675
Upper Iowa River	N. of Lansing, IA	671
Yellow River	N. of Prairie du Chien, WI	637
Wisconsin River	S. of Prairie du Chien, WI	631

At the confluence of the Bad Axe and Upper Iowa Rivers is a large concentration of wooded and emergent wetland. This area is within the UMRNWFR. The protected pugnose minnow, pallid shiner, pirate perch, bluntnose darter, and weed shiner are indicated as potential inhabitants of the waters located near the confluence of these two rivers.

2.8.4 Fisheries

The USFWS (1991) recorded 118 species of fish in this reach of the river. In 1992, the top five fish species caught commercially in Pools 9-19 were carp, buffalo, freshwater drum, channel catfish, and flathead catfish (Boland and McCarthy, 1992). In pool 6, Bolton (1986) used rotenone to collect fish samples; the highest number of fish collected were brown bullhead, black bullhead, yellow perch, orange spotted sunfish, and carp respectively. For further reference, Rasmussen (1979) provides a table showing the distribution and abundance of fishes in pools 1-10.

According to the USFWS (1992), over half of the 300,000 annual visitors to the UMRNWFR are anglers. Major sport fish include walleye, sauger, largemouth bass, smallmouth bass, white bass, northern pike, crappie, and catfish. In pool 9, Ackelson (1979) found that fishing was the most popular recreational activity. Hartman (1976) found that bluegill, walleye, crappie, sauger, and bullhead were the species caught in the greatest numbers in pool 9.

Commercial fishing is one of the major uses of the fisheries resources in this reach of the Mississippi River. In 1992, in Pools 9-19, a total of 2,150,467 pounds of fish were commercially caught; Pool 10 (810,678 pounds) ranked first followed by Pool 9 (643,905 pounds), (Boland and McCarthy, 1992). In Pools 3-26 over a 24-year period, 1953-1977, Pool 9 ranked first in commercial fish harvest (Rasmussen, 1979). Carp, buffalo, and drum were the major species caught commercially. Minor species included grass carp, shovelnose sturgeon, bullheads, and suckers (Boland and McCarthy, 1992). The estimated market value of the 1992 commercial fish harvest in Pools 9-19 was \$609,528. The average monetary value of unprocessed fish commercially harvested from Pools 9-19 for each licensed owner in 1991 was about \$4,354 (Boland and McCarthy, 1992).

Over 50 mussel species native to the Upper Mississippi River system are known to occur in Pools 1-10 (Fuller, 1978). Of the commercial mussels harvested from Pools 9-19 in 1992, 62 percent were harvested from Pools 9 and 10 (Ackerman and DeCook, 1992). In 1992, Iowa mussel fishermen reported 108,403 pounds and 159,527 pounds harvested from Pools 9 and 10 respectively. Primary species included the washboard and threeridge. The washboard and threeridge mussels were

harvested in about equal amounts, however, because of their larger size, the washboard probably accounts for a larger percentage of the total tonnage. According to Fuller (1978), the fawnfoot and threeridge were the most abundant mussel species throughout the Great I study area. Most of the collected mussels are sold for the pearl industry in the Far East.

2.8.4.1 Aquatic Species of Special Concern

Thirty-one aquatic species with protected status are present in this reach. Sixteen of these species are fish, twelve are mussels, two are reptiles, and one is an amphibian (Table 2.8-4). The winged mapleleaf mussel and the Higgins' Eye Pearly Mussel are the only species with Federal protection under the Endangered Species Act. The remainder of the species are listed as threatened or endangered by Minnesota, Wisconsin and/or Iowa.

Crawford, Vernon, and Grant Counties, respectively, contain the most occurrences of protected aquatic species (Table 2.8.4). The Higgins' Eye Pearly Mussel occurs in all pools in this reach. Important habitat for the Higgins' Eye Pearly Mussel is designated near Marais Lake in Pool 10 (USFWS, 1987).

2.8.4.2 Important Aquatic Habitat

The UMRNWFR also covers parts of this reach. Numerous mussel beds are found near Dresbach Island in Pool 7. The area between LaCrosse and Genoa, Wisconsin, contains many backwater sloughs and closed areas for refuge. Lansing Big Lake and Reno Bottoms in Pool 9 provide important habitat for the Higgins' Eye Pearly Mussel and walleye (USFWS, 1987).

Table 2.8-4

**PROTECTED AQUATIC SPECIES OF THE MISSISSIPPI RIVER
LOCK AND DAM 6 - GUTTENBERG**

Species	Federal Status	Minnesota Status	Wisconsin Status	Iowa Status	Site Occurrences by County
Black Buffalo	--	--	T	--	LaCrosse, Vernon, Crawford(4), Grant(2)
Blanding's Turtle	--	T	--	--	Winona(4)
Blue Sucker	--	--	T	--	LaCrosse, Vernon(2), Crawford(2), Grant(3)
Bluntnose Darter	--	--	E	E	Clayton(4), Allamakee, Vernon, Crawford
Buckhorn Mussel	--	--	T	E	Crawford
Butterfly Mussel	--	--	E	--	Crawford
Chestnut Lamprey	--	--	--	T	Allamakee(2)
Ebonysheil Mussel	--	--	E	--	Crawford(2)
Elephant Ear Mussel	--	--	E	--	Crawford
Gilt Darter	--	--	T	--	LaCrosse
Goldeye	--	--	E	--	LaCrosse(2), Vernon(2), Crawford(2), Grant(2)
Greater Redhorse	--	--	T	--	Vernon
Higgins' Eye Pearly Mussel	E	E	E	E	Winona, Houston, Clayton(6), Allamakee(3), Vernon, Crawford(7), Grant(3)
Longear Sunfish	--	--	T	--	Crawford(3)
Monkeyface Mussel	--	--	T	--	Vernon, Crawford(3)
Mudpuppy	--	--	--	E	Allamakee
Paddlefish	--	--	T	--	Crawford
Pallid Shiner	--	--	E	--	LaCrosse(2), Vernon(3), Crawford(11), Grant(5)
Purple Wartyback Mussel	--	--	E	T	Crawford
River Redhorse	--	--	T	--	LaCrosse(2), Grant
Rock Pocketbook Mussel	--	--	T	--	Vernon, Crawford(6), Grant
Salamander Mussel	--	--	T	--	Winona, Crawford(6), Grant
Skipjack Herring	--	--	E	--	Vernon, Crawford(2)
Speckled Chub	--	--	T	--	Trempealeau, Vernon(5), Crawford(5), Grant(4)
Spectacle Case Mussel	--	--	E	E	Winona, Crawford(2)
Starhead Topminnow	--	--	E	--	LaCrosse
Stinkpot (Turtle)	--	--	--	T	Clayton
Wartyback Mussel	--	--	T	--	Vernon(3), Crawford(19), Grant(4)
Weed Shiner	--	--	--	E	Clayton, Allamakee
Western Sand Darter	--	--	--	T	Clayton
Winged Mapleleaf Mussel	E	--	E	--	Grant

E = listed as endangered

T = listed as threatened

Important habitat for the Higgins' Eye Pearly Mussel is in Pool 10 near McGregor, Iowa. Other areas in Pool 10 have been proposed as important habitat for the Higgins' Eye Pearly Mussel (USFWS, 1987).

2.8.5 Wildlife

Nearly 300 species of birds are known to frequent the Great I study area, which includes Pools 7-10. Over 100 species are known to nest in this reach of the river (USFWS, 1975). The Upper Mississippi River provides important migration habitat for waterfowl in the Mississippi flyway. At times, up to 75 percent of the North American canvasback population can be seen in Pools 7 and 8. The UMRNWFR harbors a myriad of marsh and shore birds such as herons, egrets, rails and bitterns. The bald eagle winters in great numbers in Pools 7-10.

Fifty-nine species of mammals have been identified in the Great I study area. The lock and dam system and proper management of water and vegetation in the UMRNWFR has allowed aquatic mammals to flourish. Populations of river otter, beaver, and muskrat have all increased. Other common mammal species include white-tailed deer, coyote, red fox, gray fox, raccoon, and skunk. Southern flying squirrels are common throughout this reach of the Mississippi. Northern flying squirrels occur only along the northern portions of this reach.

Waterfowl hunting is one of the most popular outdoor activities in the Great I (USCOE, 1980) study area. The Great I study reported that an average of 78,000 ducks were harvested annually in 1974-77. Next to waterfowl hunting, deer hunting was the second most popular activity in the Great I study area. Furbearer trapping has long been an important wildlife activity along the river.

The Upper Mississippi River provides valuable habitat for a variety of reptile and amphibian species. Forty-two species of amphibians and reptiles are known to occur in the Great I study area. Common turtles in this reach include the smooth and spiny softshells and false map turtles. The Blanding's and stinkpot turtles are two state protected species that have been recorded in this reach. Common snakes include the black rat, garter, and northern watersnakes. The most common lizard in this area is the six-lined racerunner.

2.8.5.1 Wildlife Species of Special Concern

Seven wildlife species in this reach have protective status from Federal or state agencies. The bald eagle, peregrine falcon, and giant carrion beetle are the wildlife species that are Federally protected under the Endangered Species Act. The bald eagle is Federally-listed as endangered in Iowa and as threatened in Wisconsin and Minnesota. The other protected species are listed as threatened or endangered in one or more of the states bordering the river (Table 2.8-5). The bald eagle is common throughout the UMRNWFR during winter. Peregrine falcons are noted occasionally on this reach of the Mississippi River.

Table 2.8-5

**PROTECTED WILDLIFE SPECIES OF THE MISSISSIPPI RIVER
LOCK AND DAM 6 - GUTTENBERG**

Species	Federal Status	Minnesota Status	Wisconsin Status	Iowa Status	Site Occurrences by County
Bald Eagle	E/T	T	T	E	Winona, Houston(5), Clayton(4), Allamakee(13)
Eastern Massasauga Rattlesnake	--	--	E	E	LaCrosse(5), Trempealeau(2), Crawford(2)
Giant Carrion Beetle	E	--	E	--	LaCrosse
King Rail (Bird)	--	--	--	E	Allamakee
Peregrine Falcon	E	E	E	E	Winona(3), Houston(2)
Red Shouldered Hawk	--	--	T	E	Clayton(2), Allamakee(3)
River Otter	--	--	--	T	Clayton

E = listed as endangered

T = listed as threatened

Allamakee County had the most occurrences (17) of protected species. Pool 8 had the most occurrences of protected species. Minnesota and Iowa combined reported a total of 21 bald eagle occurrences, two peregrine falcon occurrences, and two red shouldered hawk occurrences in Pool 8. According to the Minnesota Department of Natural Heritage, 15 of the 21 bald eagle occurrences are nest sites. The two peregrine falcon occurrences are also nest sites.

2.8.5.2 Important Wildlife Habitat

Lake Onalaska in Pool 7 provides exceptional habitat for migrating canvasback ducks. Numerous eagle nesting sites are also located in Pool 8. Lansing Big Lake, Reno Bottoms, and Winneshick Slough are the most outstanding wildlife habitats in Pool 9 and the lower part of Pools 7 and 8. Wild celery beds, which provide an important food source for canvasbacks, are present in Pool 9 and the lower part of Pools 7 and 8. The East Channel of Prairie du Chein, Wisconsin contains populations of the Higgins' Eye Pearly Mussel (USCOE, 1980). Portions of Pools 7, 8 and 9 are closed to the public because of their value as resting areas for migrating waterfowl.

2.8.6 Fish and Wildlife Management Areas

This study reach contains 10 major FWMAs, the majority are located within Pool 9 in Allamakee County, Iowa. One of the FWMAs is a Federal wildlife refuge, seven are state-owned, and the

ownership of two was not determined. The ten management areas are listed by state in Table 2.8-6; the acreage of each is also provided in Table 2.8-6.

Table 2.8-6
FISH AND WILDLIFE MANAGEMENT AREAS
MISSISSIPPI RIVER: LOCK AND DAM 6 - GUTTENBERG

Management Areas	State	County	Pool	Type	Acres
UMRNWFR	IA,WI,MN	All	7-10	F	200,000**
Pool Slough State Wildlife Mgmt. Area	IA	Allamakee	9	S	453
Blackhawk Point State Wildlife Mgmt. Area	IA	Allamakee	9	S	186
Fish Farm Mounds State Wildlife Mgmt Area	IA	Allamakee	9	S	449
Lansing State Wildlife Area	IA	Allamakee	9	S	1,921
Lansing Big Lake State Wildlife Mgmt. Area	IA	Allamakee	9	S	752
New Albin Wildlife Area	IA	Allamakee	9	ND	200
Lansina Wildlife Area	IA	Allamakee	9	ND	ND
McGregor State Wildlife Mgmt. Area	IA	Clayton	9	S	133
Blue Lake Wildlife Area	MN	Houston	8	ND	15
Total Identified Acreage					114,109

**Acreage shown is total, amount in reach unknown.

Type: Federal (F), State (S), Local (L) ND = No Data

The UMRNWFR, a 200,000-acre refuge which covers portions of Minnesota, Wisconsin, and Illinois, extends throughout this reach. Throughout the 264-mile long refuge are nesting colonies of many great blue herons and great egrets. The UMRNWFR contains habitat for species such as river otters, herons, double-crested cormorants, great egrets, and bald eagles. Wildlife observation, hiking, boating, camping, picnicking, swimming, fishing, and photography are activities available in this refuge (Riley and Riley, 1993).

Pool Slough WMA, north of the town of Lansing, provides opportunities for hunting of waterfowl and deer. Just below Pool Slough is Blackhawk Point WMA, which is used for hunting of wildlife

such as deer, grouse, turkey, and woodcock. Lansing State Wildlife Area, below the Iowa River, is home to deer, squirrel, grouse, turkey, and woodcock. West of Kains Lake is the Fish Farm Mounds Wildlife Area, which offers hunting and viewing of various wildlife species (Sportsman's Atlas Co., 1994).

2.8.7 Natural Areas

Eleven natural areas are in this study area. Features include bluff prairie, delta marsh, rookeries, burial mounds, dolomite exposures and other unique habitat. One area is of national significance; Wyalusing Walnut Forest State Natural Area in Wisconsin is a national natural landmark. The areas are listed by state in Table 2.8-7; the acreage and approximate location by county and river pool are also provided.

Table 2.8-7
NATURAL AREAS
MISSISSIPPI RIVER: LOCK AND DAM 6 - GUTTENBERG

Natural Areas	State	County	Pool	Type	Acre
King and Queens Bluff State Natural Area	MN	Winona	7	S	178
Crosby Slough Natural Area	MN	Houston	8	ND	ND
Reno Bottom Research Natural Area	MN	Houston	8	F	ND
Black River Bottoms Natural Area	WI	LaCrosse	7	ND	ND
Van Loon Natural Area	WI	LaCrosse	7	ND	ND
Rosebud Island Natural Area	WI	LaCrosse	7	ND	ND
Sunset Point Natural Area	WI	LaCrosse	7	ND	ND
Myrick Marsh Natural Area	WI	LaCrosse	8	ND	ND
Chain of Lakes Marsh Natural Area	WI	Crawford	9	ND	ND
Walnut Eddy Island Natural Areas	WI	Grant	10	ND	ND
Wyalusing Walnut Forest State Natural Area	WI	Grant	10	S	190
Total Identified Acreage					368

Type: Federal (F), State (S), Private (P) ND = No Data

Three of the natural areas are in Minnesota. Kings and Queens Bluff is in O.L. Kipp State Park south of Winona. The area features a spectacular bluff prairie (Minnesota DNR, 1991). Crosby Slough Natural Area is adjacent to Reno Bottoms Research Natural Area. Both areas are within the UMRNWFR. Crosby Slough serves as excellent waterfowl habitat especially for diving ducks.

Species include canvasbacks, ring necks and tundra swans. Reno Bottoms is a 1200-acre area which has significant heron rookeries. Bald eagles nest, feed, and winter here. The area is an excellent wood duck nesting and rearing site and hosts a good population of beavers and muskrats; otters have been reported as well. Reno Bottoms is a migration habitat for numerous widgeons, mallards, gadwalls, and other dabbling ducks (USFWS, 1987).

Eight of the natural areas are in Wisconsin. Black River Bottoms Natural Area and Van Loon Natural Area are adjacent to each other at the confluence of the Black River. The areas feature dynamic delta marshes, backwater sloughs, and bottomland forest. Wetland values include habitat for wood ducks, hooded mergansers, swans, geese, dabblers, and raptors. The areas serve as a heron rookery and has potential as an eagle nesting site. State-threatened raptors have used the area. A state-endangered reptile is also found here. Rosebud Island Natural Area near Lake Onalaska is upland island habitat. This area provides food and nesting sites for waterfowl, small game, deer, and furbearers. Sunset Point Natural Area located near Lake Onalaska is heavily used by waterfowl. The lake has excellent beds of wild celery making it a significant staging area for canvasbacks.

Myrick Marsh Natural Area near LaCrosse is surrounded by development. The area features wetlands which are used by egrets, muskrats, and northern pike spawning habitat. Commercial fishermen work in this area. Chain of Lakes Natural Area features open water habitat where canvasbacks aggregate to feed on wild celery. The area serves as a rookery for herons and egrets; eagle roosting and nesting sites are also present. Wisconsin-endangered reptiles, fish, and shorebirds are found here. Walnut Eddy Island Natural Area and Wyalusing Walnut Forest State Natural Area are located at the confluence of the Wisconsin River near Prairie du Chein. The Walnut Eddy area features shallow fast-moving sandy bottoms. The scenic Wisconsin River is an important area for commercial fishing. Two Wisconsin-threatened fish and a Wisconsin-threatened raptor have been reported here.

Wyalusing Walnut Forest State Natural Area is a national natural landmark. The area features 25 acres of southern dry forest, 35 acres of southern wet-mesic forest, 80 acres of southern wet-mesic forest and 50 acres of floodplain forests. The area features numerous black walnuts, a main component of the mature forest. The floodplain forest dominants are silver maple, elm, and cottonwood. Cliffs rise 500 feet above the river and are host to plant species including yew, sullivantia, and amethyst shooting star. The area is host to 250 bird species; over 40 species nest in the area. Unusual flora include walking fern, narrow-teaved spleenwort, Goldie's fern, and dragon sagewort. Wisconsin-endangered fish and raptors have been reported in the area. The site is nesting habitat for a state-threatened bird (USCOE, 1983; USFWS, 1987; Wisconsin DNR, 1989).

2.8.8 Recreation Areas

This study reach contains 25 major recreation areas. State parks and forests account for seven of the 25 recreation areas. One Federal recreation area, Effigy Mounds National Park, is found in this study reach; the remaining 17 recreation areas are locally-owned. Picnicking was the most commonly available recreation opportunity along this study reach. Camping, hunting/fishing, hiking/biking, and water activities were less common. In this study reach are 86 boat accesses, 1,575 camping units, 2,135 picnicking units, and 96 miles of hiking trails (USCOE, 1980). The 25 recreation areas and the activities which they provide are listed in Table 2.8-8.

Table 2.8-8

RECREATION AREAS
MISSISSIPPI RIVER: LOCK AND DAM 6 - GUTTENBERG

Recreation Area	State	County	Pool	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
O.L. Kipp State Park	MN	Winona	7	2,835	S	X	X	--	X	--
Baeder Park	MN	Winona	7	ND	L	--	X	--	--	X*
Wildcat County Park	MN	Houston	8	104	L	X	X	X	X	X*
Richard J. Dorer Memorial State Forest	MN	Houston, Winona	8	43,000	S	--	--	X	--	--
Louis Nelson Park	WI	LaCrosse	7	ND	L	--	X	--	--	X
Pettibone Park	WI	LaCrosse	8	ND	L	--	X	--	--	--
Houska Park	WI	LaCrosse	8	ND	L	X	X	--	--	X
Goose Island Park	WI	LaCrosse	8	ND	L	--	X	--	--	--
Stoddard Park	WI	Vernon	8	ND	L	--	X	--	--	--
Blackhawk Memorial Park	WI	Vernon	9	ND	L	X	--	--	--	X*
Battle Island Park	WI	Vernon	9	ND	L	ND	ND	ND	ND	ND
Sugar Creek Park	WI	Crawford	9	ND	L	X	X	--	--	--
Lawler Park	WI	Crawford	10	ND	L	--	X	--	--	X*
Wyalusing State Park	WI	Grant	10	2,596	S	X	X	X	X	X*
Jellystone Park	WI	Grant	10	ND	L	X	X	--	X	--
Fish Farm Mounds	IA	Allamakee	9	576	L	--	X	X	X	--
Mt. Hosmer Park	IA	Allamakee	9	ND	L	--	X	--	X	--
Clear Creek Park	IA	Allamakee	10	ND	L	--	--	X	--	--
Yellow River State Forest	IA	Allamakee	10	7,889	S	X	X	X	X	--
Effigy Mounds National Park	IA	Allamakee	10	1,475	F	--	--	--	--	X
McGregor State Park	IA	Clayton	10	ND	S	--	X	--	--	X
Pikes Peak State Park	IA	Clayton	10	970	S	X	X	--	X	X
Guttenberg City Park	IA	Clayton	10	ND	L	--	X	--	--	--
Point Ann State Park	IA	Clayton	10	ND	S	--	--	--	--	X
Bloody Run Park	IA	Clayton	10	135	L	X	X	X	--	--
Total Identified Acreage				59,580						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Yellow River State Forest, comprised of the Lost 40, Yellow River, Waukon Junction, Mud Hen, Luster Heights, Paint Creek, and Paint Roof units, is located southwest of Harpers Ferry in Allamakee County, Iowa. The forest offers bridle and hiking trails, snowmobiling and cross-country skiing trails, and hunting. Squirrels, deer, grouse, turkey, and woodcock, as well as waterfowl inhabit the forest.

Wyalusing State Park, south of the junction of the Mississippi and Wisconsin Rivers near the town of Wyalusing in Grant County, Wisconsin, serves as a wildlife refuge as well as a park. Wildlife inhabiting the area include bats, beaver, mink, muskrat, foxes, coyote, bald eagles, hawks, owls, and waterfowl. Wyalusing Walnut Forest and Wyalusing Hardwood Forest are two unique scientific areas found within the park. Recreational opportunities include fishing, canoeing, boating, swimming, bicycling, and hiking (Wisconsin DNR, 1989).

The O.L. Kipp State Park, southeast of Winona in Winona County, lies within Richard J. Dorer Memorial Hardwood Forest. The park contains over 120 resident mammal, reptile, amphibian, and bird species, including opossum, spotted skunk, indigo bunting, ruffed grouse, wild turkey, red-tailed hawks, great horned owls, golden and bald eagles, and red fox; the six-lined racer and bobwhite frequent the area.

Wood bluff tops, tallgrass prairies, and wetlands are present throughout Effigy Mounds National Park, a 1,475-acre park and monument north of Marquette in Allamakee County, Iowa. The park offers a visitors center, museum, and historic Indian mounds.

Pikes Peak State Park, located south of McGregor in Clayton County offers camping, picnicking, and hiking facilities. Historic sites, scenic overlooks, boardwalks, and observation platforms provide other recreational activities.

2.8.9 Data Gaps

The NWI data was insufficient to include in the report. Total wetlands acreage was taken from the land use/land cover data. Descriptions were based on a review of USGS maps.

2.8.10 References Cited

- Ackelson, M.C. 1979. *A Recreational Use Survey of Pool 9*. Iowa Conservation Commission.
- Ackermann, G. and R. DeCook. 1992. *Commercial Harvest of Freshwater Mussels in Iowa*.
- Boland, T. and T. McCarthy. 1992. *Mississippi and Missouri Rivers Commercial Fishing Report*. 1992.
- Bolton, H. 1986. *A preliminary evaluation of various traditional and nontraditional gears used to sample fish populations*. Special in-house report. U.S. Fish and Wildlife Service, Winona, Minnesota.
- Curtis, John T. 1959. *The Vegetation of Wisconsin*. The University of Wisconsin Press. Madison, WI.
- Fuller, S.L.H. 1978. in USCOE, 1980.
- Hartmann, E. 1976. in Ackelson, 1979.
- Küchler, A.W. 1975. *Potential Natural Vegetation of the Conterminous United States*. American Geographical Society. New York, NY.

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Minnesota Department of Natural Resources. 1991. *Public Recreation Information Map: Caledonia Area*. Minneapolis, Minnesota.

National Park Service. 1994. *Draft Mississippi River Corridor Study, Vol 2: Inventory of Resources and Significance*.

Rasmussen, J.L. 1979. in USCOE, 1980.

Riley, L. and Riley, W. 1993. *Guide to the National Wildlife Refuges*. MacMillan Publishing Company. New York, NY.

Sportsman's Atlas Co. 1994. *Iowa Sportsman's Atlas*. Lytton, IA.

U.S. Army Corps of Engineers. 1980. *Great I-A Study of the Upper Mississippi River*.

U.S. Army Corps of Engineers. 1983. *Upper Mississippi River Land Use Allocation Plan; Master Plan for Public Use Development and Resource Management Part I and Part II*. St. Paul, MN.

U.S. Fish and Wildlife Service. 1975. in USCOE, 1980.

U.S. Fish and Wildlife Service. 1987. *Resource Classification System; Upper Mississippi River National Wildlife and Fish Refuge*.

U.S. Fish and Wildlife Service. 1991. *Fishes of the Upper Mississippi Wildlife and Fish Refuge*. Brochures. Winona, MN.

U.S. Fish and Wildlife. 1976-1992. *The Upper Mississippi River Wildlife and Fish Refuge, Pools 4-14 Maps*.

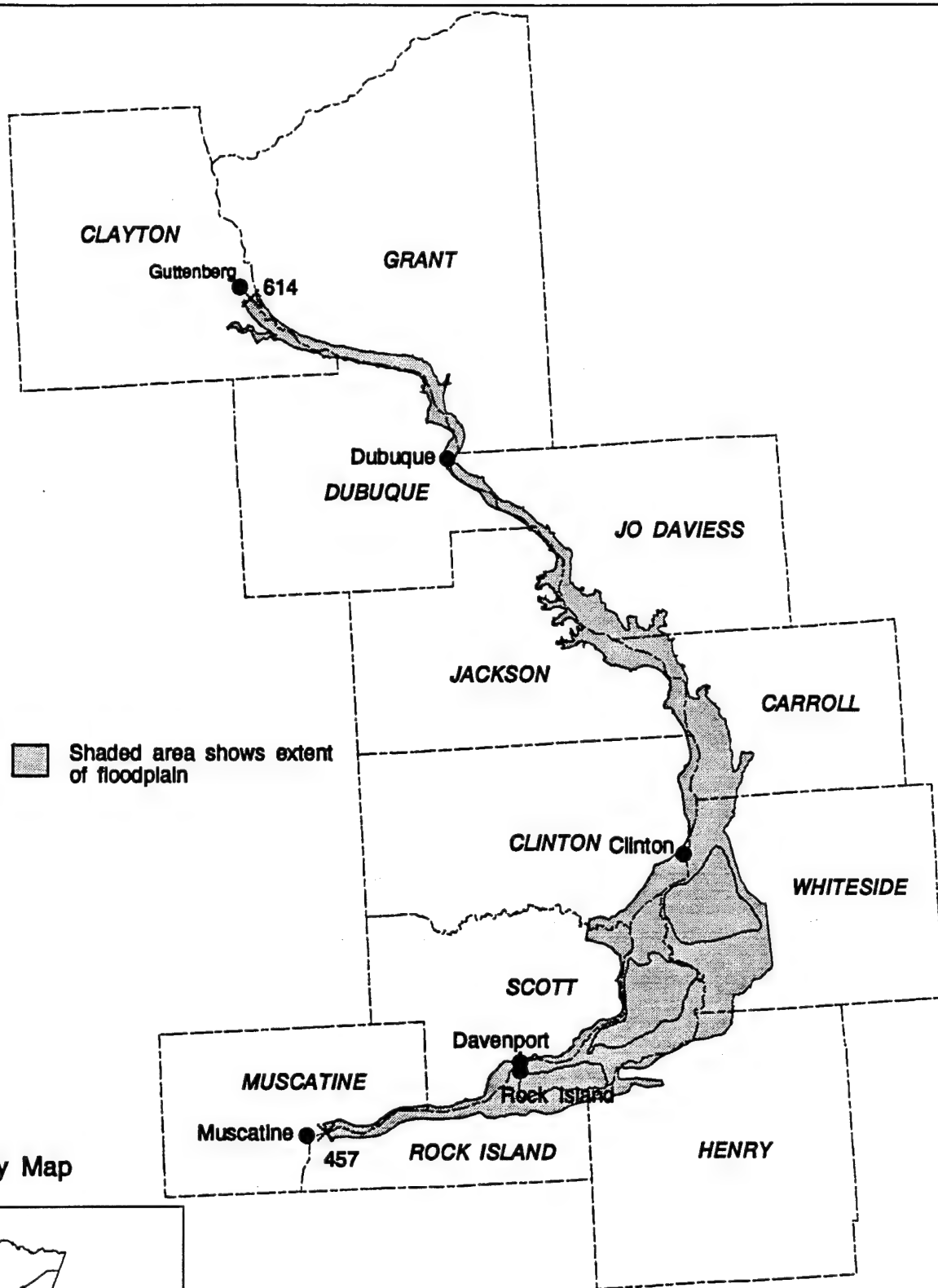
Wisconsin Department of Natural Resources. 1989. *Wyalusing Walnut Forest State Natural Area*. Fact Sheet No. 89. Bureau of Endangered Resources, Madison, WI.

2.9 MISSISSIPPI RIVER: GUTTENBERG TO MUSCATINE, IOWA

This study reach is approximately 157 river miles in length (see Figure 2-9). It begins south of Guttenberg at RM 614 and ends at Lock and Dam 16 (RM 457). The reach flows through three states, six Iowa counties, five Illinois counties, and one Wisconsin county. Major communities along this reach include: Dubuque and Clinton, Iowa; the "Quad Cities" of Davenport and Bettendorf, Iowa and Moline and Rock Island, Illinois. The Wapsipinicon and Rock Rivers are the primary tributaries entering the Mississippi River along this reach.

2.9.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.9-1. Descriptions of the state soil associations are provided in Appendix A.



Key Map

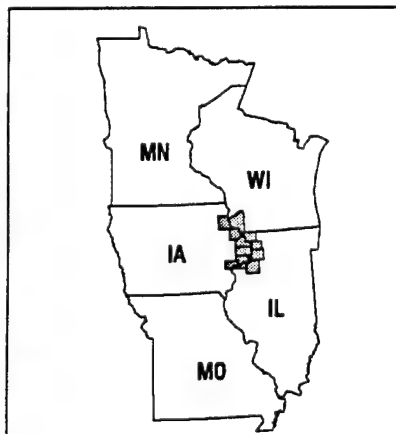


Figure 2-9
Mississippi River:
Guttenburg to Muscatine, Iowa

Table 2.9-1

**SOIL ASSOCIATIONS
MISSISSIPPI RIVER: GUTTENBURG - MUSCATINE**

Soil Association	State	Occurrences	Acres	Percent
DORCHESTER-CHASEBURG-COLO	WI	2	5,910	2
DORCHESTER-CHASEBURG-COLO	IA	26	32,260	8
FAYETTE-NORDNESS-ROCK.OUTCROP	IA	56	1,530	<1
STONY AND ROCKY LAND-VALTON-FAYETTE	WI	8	750	<1
SEATON-LACRESCENT-LAWSON	WI	2	1,290	<1
DORCHESTER-WAKELAND-BEAVERCREEK	IL	8	13,970	4
PALSGROVE-DUBUQUE-FAYETTE	IL	11	1,930	<1
FAYETTE-ROZETTA-ELEROY	IA	9	1,250	<1
SEATON-LACRESCENT-LAWSON	IL	25	40,140	11
GILFORD-MAUMEE-SPARTA	IL	18	49,780	13
FAYETTE-ROZETTA-PALSGROVE	IL	9	530	<1
DEL.REY-MILFORD-SAYLESVILLE	IL	2	1,310	<1
SAWMILL-GENESEE-LAWSON	IL	4	122,640	32
TELL-LAMONT-PORT-BYRON	IL	5	6,240	2
DRUMMER-PLANO-ELBURN	IL	8	12,340	3
TAMA-DOWNS-ATTERBERRY	IA	1	120	<1
TITUS-WABASH-ROWLEY	IA	4	9,530	2
HOUGHTON-LENA-MUSKEGO	IL	1	3,760	<1
DOWNS-FAYETTE-CHASEBURG	IA	3	210	<1
PORT BYRON-JOY-SEATON	IL	2	14,850	4
FAYETTE-DOWNS-LINDLEY	IA	13	3,980	1
COLO-NODAWAY-ZOOK	IA	2	17,190	4
DINSDALE-TAMA-KLINGER	IA	1	30	<1
WAUKEGAN-RICHWOOD-JOY	IL	8	1,610	<1
TAMA-MUSCATINE-GARWIN	IA	1	240	<1
ROZETTA-FAYETTE-HICKORY	IL	13	38,260	10
TAMA-KILLDUFF-COLO	IA	1	10	<1
BEAUCOUP-LAWSON-DARWIN	IL	1	470	<1
SOIL ASSOCIATIONS SUB TOTAL	--	244	382,130	100
UNCLASSIFIED AQUATIC	ALL	6	78,680	--
SOILS AND AQUATIC TOTAL	--	--	460,810	--

2.9.2 Land Use/Land Cover

2.9.2.1 Land Use

This reach contains a total of 460,810 acres of floodplain (Table 2.9-2). Several large urban areas are along this reach. The largest urban complex is the Davenport-Rock Island metropolitan area. Dubuque and Clinton, Iowa are the other substantial urban areas in the reach. Industrial uses along the river are primarily concentrated near the urban areas. These include large fleet and transfer areas; storage for bulk products, grains, fuels and commodities; the Dubuque power plant; and the Quad-Cities Nuclear Power Station. Two military installations are in this reach. The Savanna Army Depot is across from Bellevue, Iowa, in Illinois and the Rock Island Arsenal is on an island in the Quad Cities area (Peterson, 1984).

Table 2.9-2

**LAND USE/LAND COVER
MISSISSIPPI RIVER: GUTTENBERG - MUSCATINE**

Cover Type	Acres	Percent
Urban	56,470	12
Agriculture	233,540	51
Upland Forest	27,320	6
Forested Wetland	40,780	8
Non-Forested Wetland	15,850	3
Water	86,600	19
Barren	250	< 1
Total	460,810	100

The dominant land use in this reach is agriculture. The largest concentration of agricultural land is found in Carroll, Whiteside and Henry County, Illinois. Another large area of farmland is at the confluence of several small rivers in Jackson County, Iowa. Remaining agricultural land is found at the edge of the floodplain.

2.9.2.2 Vegetation

Natural vegetation of much of the reach is bluestem prairie. On the left descending bank in Illinois, the prairie is interspersed with oak/hickory forest. The northern end of the reach in Wisconsin is a combination of southern hardwood forest and oak savanna (NPS, 1994). Henry and Rock Island Counties, Illinois have the largest acreages of forest. Extensive forested wetlands are found on islands in the river.

2.9.2.3 Plant Species of Special Concern

Six species of special concern have been observed in this reach. Four are at the edge of the floodplain in Grant County, Wisconsin. Two plant species listed as endangered in Iowa are in this reach. No protected species are in the Iowa portion of the reach. None of the species have Federal status. The plant species are listed in Table 2.9-2a.

Table 2.9-2a

PROTECTED PLANT SPECIES OF THE MISSISSIPPI RIVER GUTTENBERG - MUSCATINE

Species	Federal Status	Iowa Status	Illinois Status	Wisconsin Status	Site Occurrences by County
Bulrush	--	--	E	--	Carroll
Giant Yellow Hyssop	--	--	--	T	Grant
Hairy Umbrella-wort	--	--	E	--	Jo Daviess
Prairie Indian Plantain	--	--	--	T	Grant
Round-Fruited St. John's Wort	--	--	--	T	Grant
Wild Quinine	--	--	--	T	Grant

E = listed as endangered

T = listed as threatened

2.9.3 Aquatic Resources

2.9.3.1 Wetlands

Within this study reach, approximately 53,170 acres of vegetated wetland are in the adjacent floodplain. The majority are classified as forested wetland (Table 2.9-3).

Table 2.9-3

AQUATIC RESOURCES¹
MISSISSIPPI RIVER: GUTTENBERG - MUSCATINE

Wetland Class	Acres	Percent
Forested	40,780	77
Shrub/Scrub	1,900	3
Emergent	10,490	20
Water Resources	Acres	Number
Lakes & Ponds	17,500	304

¹Extrapolated from 92 percent coverage.

The vegetated wetlands appear to be evenly distributed along the river segment. Large forested wetland habitats are located on several islands within the channel of the Mississippi. Some of the major islands containing significant wetland areas include:

Island	River Mile
Beaver Island	514
Chimneys Island	476
Horse Island	473
Andalusia Island	469

Beaver Island is located near Clinton, Iowa; the other three islands are situated between Muscatine, Iowa and Rock Island, Illinois. Andalusia Island is approximately 15 river miles in length. The island is between Muscatine, Iowa and Davenport, Iowa. The island contains over 2,000 acres of forested wetland.

South of Guttenberg, Iowa is a large forested wetland system associated with a large peninsula/island complex. Most of this area is located inside the perimeter of two management areas: the Nelson Dewey State Park and the UMRNWFR. Adjacent to these areas, on the Iowa side of the river, is the Turkey River Mounds Monument State Preserve. While this preserve does not contain a significant amount of wetland area, wetland systems are nearby. In addition, this state preserve is in proximity to two protected species: the bald eagle and the Higgins' Eye Pearly Mussel.

Below Lock and Dam 11, is a large area containing numerous islands, sloughs, and peninsulas. Below Lock and Dam 12 near Bellevue, Iowa are expansive, contiguous wetland areas. Over 5,000 acres of forested wetland appear to be within the boundaries of the UMRNWFR. In addition,

the Green Island State WMA (SWMA) is within this reach. At least three quarters of the SWMA is forested wetland. The protected red shouldered hawk, river otter, and bald eagle have been reported to occupy portions of these state and Federal areas.

A large forested wetland area is below (downstream) the dam at Clinton, Iowa. In addition, moderately large areas of linear wetlands are adjacent to surface drainage systems. These drainage systems are east of Clinton, on the Illinois side of the river. Over 1,500 acres of forested wetland are within the southernmost city limits of Clinton. Emergent wetlands are along linear drainage canals located on the Illinois side of the river near Clinton.

The Princeton SWMA is surrounded by forested wetland. In addition, several small pools and scour holes are adjacent to the SWMA. The protected red shouldered hawk, Higgins' Eye Pearly Mussel, and river otter are known to inhabit the Princeton SWMA.

2.9.3.2 Lakes and Ponds

Approximately 304 individual lakes and ponds are located within the river segment. The total surface area of these lakes and ponds is approximately 17,500 acres.

As with the wetland areas, many of these water bodies are in association with state or Federally managed lands. Several small pools are near Princeton SWMA. An oxbow lake covering over 50 acres is just across the river from the SWMA. Green Island SWMA contains numerous large open water systems. Several oxbow lakes and sloughs form a mosaic northwest of Mississippi Palisades State Park; significant emergent wetlands accompany these lakes. Several pools are also on the south end of Clinton, Iowa. At RM 525, a large pool or scour hole on the Illinois side of the Mississippi River. At the confluence of the Rock and Mississippi Rivers, is a large concentration of wooded and emergent wetland.

2.9.3.3 Tributaries

Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
Turkey River	S. of Guttenberg, IA	608
Grant River	N. of Dubuque, IA	593
Platte River	N. of Dubuque, IA	588
Little Maquoketa River	N. of Dubuque, IA	587
Menominee River	S. of Dubuque, IA	571
Sinsinawa River	S. of Dubuque, IA	569
Galena River	Galena, IL	565
Maquoketa River	N. of Savanna, IL	549
Apple River	N. of Savanna, IL	545
Wapsipinicon River	S. of Clinton, IA	507
Rock River	Rock Island, IL	479

2.9.4 Fisheries

The Mississippi River supports a variety of fish and mussel fauna. Van Vooran (1983) reports 96 species of fish present in Pools 11-13. Carp, smallmouth buffalo, and freshwater drum were among the most abundant fish in the habitats sampled in Pools 11-13 by Bertrand and Miller (1973). The Great II studies (Breitenbach and Peterson, 1980) reported that 102 fish species are known to occur in the stretch of the Mississippi River between Pools 11-22 (Great II project area). In the Great II study, gizzard shad, freshwater drum, and carp were found to be most abundant. For further reference, Van Vooran (1983) provides a table showing the distribution and abundance of fish in the Great II project area.

Approximately 30 species comprise the sports fishery of the Upper Mississippi River in Pools 11-22 (Breitenbach and Peterson, 1980). Major gamefish in the Mississippi River include crappie, bluegill, channel catfish, walleye, and sauger (Konrad, 1994). Other gamefish sought by anglers in this reach of the Mississippi include freshwater drum, white bass, smallmouth bass, largemouth bass, and yellow perch. Ackerman (1978) found black crappie, bluegill, freshwater drum, white crappie, and white bass as the top 5 major gamefish caught by anglers in Pool 11 (Ackerman, 1978).

Commercial fishing in the upper Mississippi River has occurred since before the locks and dams were built. In 1979, in Pools 11-13, a total of 1,567,703 pounds of fish were commercially caught. In 1992, Pool 13 ranked first in commercial fish harvest within the Rock Island District of the upper Mississippi River (Boland and McCarthy, 1992). Carp, buffalo, and drum were the three most important species in the commercial harvest from Pools 11-13. Minor species caught commercially include gar, bowfin, American eel, and mooneye. Trammel nets and seines are the primary fishing gear used.

Commercial fishing for mussels within this reach occurs primarily in Pools 11, 13 and 16. In 1992, 55,391 pounds, 18,083 pounds and 22,612 pounds were harvested in Pools 11, 13 and 16 respectively. Harvested amounts in Pools 12, 14 and 15 were smaller: 4,689, 1,721 and 2,297 respectively (Ackerman and DeCook, 1992). Pools 14, 15 and 16 are recognized as three of the five best remaining pools with substantial mussel populations within the Great II study area (Breitenbach and Peterson, 1980). The primary mussel species collected were the washboard and the threeridge. Smaller numbers of mapleleaf, pigtoe, and pink heel splitter were also collected. A study in Pool 11 found that the hickory nut, threeridge, and pigtoe comprised over 53 percent of the study sample (Eckbald, 1986).

2.9.4.1 Aquatic Species of Special Concern

Nineteen aquatic species with protected status are in this reach of the Mississippi River (Table 2.9-4). Nine of these species are mussels and ten are fish. The Higgins' Eye Pearly Mussel is the only species that has Federal protection under the Endangered Species Act. The remainder of the species are listed as threatened or endangered by at least one of the states.

Pools 14, 13 and 16 respectively contain the most occurrences of protected aquatic species. Of the counties, Grant County has the most recorded occurrences. The Higgins' Eye Pearly Mussel occurs in all pools in this reach except Pool 13. Several state protected mussels are within existing mussel sanctuaries in the upper Mississippi River such as Sylvan Slough Mussel Sanctuary in Pool 16.

Table 2.9-4

**PROTECTED AQUATIC SPECIES OF THE MISSISSIPPI RIVER
GUTTENBERG - MUSCATINE**

Species	Federal Status	Iowa Status	Illinois Status	Wisconsin Status	Site Occurrences by County
Black Buffalo	--	--	--	E	Grant
Blue Sucker	--	--	--	T	Grant
Bluntnose Darter	--	E	--	E	Grant(2)
Butterfly Mussel	--	T	T	E	Rock Island(5), Grant
Ebonyshell Mussel	--	--	T	E	Grant
Goldeye	--	--	--	E	Grant
Higgin's Eye Pearly Mussel	E	E	E	E	Rock Island(3), Scott(9), Clinton(6), Dubuque(2), Grant, Jo Daviess
Lake Sturgeon	--	E	E	--	Rock Island, Whitside, Jo Daviess, Carroll, Scott
Paddlefish	--	--	--	E	Grant
Pallid Shiner	--	--	E	E	Rock Island, Grant(6)
River Redhorse	--	--	T	T	Grant(2)
Rock Pocketbook Mussel	--	--	--	T	Grant(11)
Salamander Mussel	--	--	E	T	Grant
Sheepnose/Bullhead Mussel	--	E	E	E	Rock Island
Speckled Chub	--	--	--	T	Grant(4)
Spectacle Case Mussel	--	E	E	E	Rock Island(3), Muscatine, Jo Daviess
Wartyback Mussel	--	--	--	T	Grant(15)
Western Sand Darter	--	T	E	--	Rock Island, Carroll, Jackson(2)
Yellow Sandshell Mussel	--	E	--	E	Grant

E = listed as endangered

T = listed as threatened

2.9.4.2 Important Aquatic Habitat

This segment of the river contains one mussel sanctuary, six important tailwater fisheries, several important backwater lake and slough areas, and numerous important aquatic habitats. The Sylvan

Slough Mussel Sanctuary is located in Pool 16. This sanctuary supports a diverse population of native mussels, including those protected by adjacent states.

Important backwater lake and slough areas exist in Pools 11 and 13. Cassville Slough in Pool 11 has received more study than any other side channel in Pools 11-13 (Ekbald, 1986). Brown's Lake in Pool 13 consists of small ponds and sloughs suitable for fish habitation (Bolan and Reetz, 1979). Important tailwater fisheries exist below each lock and dam. In general, the tailwaters contain important sport and commercial fisheries. Important sport and commercial fisheries are located throughout the river. In general, these fisheries are associated with island chutes, side channels, backwater sloughs and mouths of moving streams.

2.9.5 Wildlife

The Mississippi River corridor provides crucial migration habitat for 28 species of waterfowl each year. Approximately 5 million waterfowl utilize the Mississippi Flyway each fall (Bellrose, 1976). Important diving and dabbling ducks utilizing this reach include lesser scaup, ring-necked duck, canvasback, mallard, wood duck, black duck, and pintail. Common geese in this reach of the Mississippi include Canada geese, lesser snow geese, blue geese, and white-fronted geese (Breitenbach and Peterson, 1980). Thousands of tundra swans rest in this reach during the spring migration. Other non-game birds common in this reach include warblers, sparrows, broad-winged hawks, herons, and egrets. The bald eagle is a common transient in this area from October through March.

The UMRNWFR consists of about 200,000 acres of land and includes Pools 11-14 of this reach. The refuge harbors vast numbers of migratory waterfowl as well as deer and other mammals. According to the USFWS (USFW, 1978), 57 species of mammals and 292 species of birds (USFW, 1991) have been identified in the refuge. Common mammals of the refuge and this reach include the muskrat, mink, beaver, otter, raccoon, skunk, weasel, and fox. Other mammals include gray and fox squirrel, and cottontails. A few nutria have also been observed in the refuge. The UMRNWFR provides valuable habitat for the Illinois endangered and Iowa threatened river otter.

A diverse community of amphibians and reptiles occurs in this reach. Twenty species of amphibians and 41 species of reptiles occur in Pools 11-13 (Breitenbach and Peterson, 1980). According to the USFWS (1992), 37 species of reptiles and amphibians occur in the UMRNWFR. Common snakes in this reach include the northern water snake, garter snake, and the eastern hognose snake. Other species likely to be present in this reach include dark-sided and eastern tiger salamanders; and chorus, green, pickerel, and wood frogs. Common turtles in this reach include the common snapping turtle, western painted turtle, and the map turtle. The six-lined racerunner is the only common lizard, although other lizards might occur.

2.9.5.1 Wildlife Species of Special Concern

Nine species of wildlife that have protective status from Federal and state agencies are in this reach (Table 2.9-5). The bald eagle and giant carrion beetle are Federally-protected. The bald eagle is listed as Federally endangered in Iowa and Illinois, and Federally-threatened in Wisconsin. The other protected species are listed as threatened or endangered in one or more of the states bordering the river. The bald eagle is common throughout this reach during the winter months.

Table 2.9-5

**PROTECTED WILDLIFE SPECIES OF THE MISSISSIPPI RIVER
GUTTENBERG - MUSCATINE**

Species	Federal Status	Iowa Status	Illinois Status	Wisconsin Status	Site Occurrences by County
Bald Eagle	E	E	E	T	Rock Island(2), White Side, Jo Daviess, Carroll(2), Jackson(3), Clinton,(3)
Black-Crowned Night Heron	--	--	E	--	Rock Island
Double-Crested Cormorant	--	--	T	--	Carroll, Whiteside
Giant Carrion Beetle	E	--	--	E	Grant
Great Egret	--	--	T	T	Rock Island, Carroll, Whiteside
Red-Shouldered Hawk	--	E	E	T	Clinton(3), Jackson, Jo Daviess,(2), Rock Island
River Otter	--	T	E	--	Whiteside, Carroll(3), Scott(2), Jackson, Dubuque, Jo Daviess(3), Rock Island
Western Hognose Snake	--	E	T	--	Rock Island
Yellow Headed Blackbird	--	--	E	--	Jo Daviess

E = listed as endangered

T = listed as threatened

In this reach, Pool 12 had the most occurrences of protected wildlife species. Federally protected wildlife species occur throughout this reach. The river otter has been observed in all pools in this reach except for Pools 15 and 16. Besides the river otter, seven bird species, one reptile species, and one insect species are protected in this reach (Table 2.9-5).

2.9.5.2 Important Wildlife Habitat

The Savannah Army Depot Wildlife Area, Green Island SWMA and the Big Bend Conservation Area provide important habitat for river otters, bald eagles, herons, cormorants and egrets. Heron rookeries are located throughout the reach and the only cormorant rookery in Iowa occurs in Pool 13. A great egret rookery is in Pool 12 and bald eagle nests occur in Pools 11 and 13. Important bald eagle perching and roosting areas are throughout this reach. Pools 13 and 14 of this reach contain numerous areas designated by the Illinois Department of Conservation as essential habitat for the river otter.

Pools 11-14 are part of the UMRNWFR. These pools are intensively managed by the USFWS. The Cassville Slough Area of Pool 11 provides important habitat for waterfowl, eagles, and white-tailed deer. The Savanna Army areas in Pools 12 and 13 provide important habitats for river otters, bald

eagles, and waterfowl. The UMRNWFR provides important habitat for many wildlife species in this reach.

2.9.6 Fish and Wildlife Management Areas

This study reach contains eight major FWMAs (see Table 2.9-6). Federal wildlife refuges account for one of the nine FWMAs; six areas are state-owned. Over 73,000 acres of the land and water in this reach are managed by Federal and state agencies for wildlife production and protection. Approximately half of these FWMAs are located in Pool 13 (USCOE, 1980).

Table 2.9-6

FISH AND WILDLIFE MANAGEMENT AREAS MISSISSIPPI RIVER: GUTTENBERG - MUSCATINE

Management Areas	State	County	Pool	Type	Acres
UMRNWFR	IL,IA,WI	All	11-14	F	60,000+
Dago Slough Closed Wildlife Sanctuary	WI	Grant	11	S	ND
Green Island SWMA	IA	Jackson	13	S	3,722
Princeton State SWMA	IA	Clinton, Scott	14	S	1,178
Savanna Army Depot Wildlife Area	IL	Jo Daviess	12-13	S	6,500
Big Bend State Conservation Area	IL	Whiteside	14	S	1,188
Oak Valley Eagle Refuge	IL	Rock Island	14	L	ND
Andalusia Refuge	IL	Rock Island	16	S	600
Total Identified Acreage					73,188

Type: Federal (F), State (S), Local (L) ND = No Data

The UMRNWFR which covers portions of Wisconsin, Iowa, and Illinois, is the largest FWMA in this reach, with over 60,000 acres. Wildlife inhabiting the area include swans, canvasbacks, great blue herons, great egrets, warblers, songbirds, and deer. Throughout the 264-mile long refuge are nesting colonies of many herons and egrets. UMRNWFR contains habitat for protected species such as river otters, double-crested cormorants, great egrets, and black-crowned night herons. Wildlife observation, hiking, boating, camping, picnicking, swimming, fishing, and photography are possible activities within this refuge (Riley and Riley, 1993).

South of Hanover in Jo Daviess County, Illinois, is the Savanna Army Depot which contains 6,500 acres of backwaters and islands suitable for bald eagle and great egret habitat. The USFWS manages portions of the depot (USCOE, 1980).

The Green Island SWMA, northwest of the town of Ohio in Jackson County, serves as a nesting site for hooded mergansers. This wildlife area is also habitat for the river otter, (an Iowa threatened species), and the bald eagle and the red-shouldered hawk (Peterson, 1984).

The Big Bend State Conservation Area, east of the town of Prophetstown in Whiteside County, provides opportunities for hunting, hiking, and fishing. The Big Bend area is a satellite of Prophetstown State Recreation Area (American Park Network, 1994).

Princeton SWMA, in Clinton and Scott Counties, Iowa, serves as habitat for the Higgin's eye pearly mussel and the river otter. Andalusia Refuge on Andalusia Island in Rock Island County, Illinois is owned by the state and managed strictly as a waterfowl refuge (Peterson, 1984).

2.9.7 Natural Areas

This study reach contains eleven major natural areas. Significant features include rookeries, geologic formations, archeological sites, bottomlands, sand terrace, dunes, and blowouts. Mississippi Palisades in Illinois is listed as a national natural landmark. The natural areas are listed by state in Table 2.9-7; this acreage and approximate location by river pool are also provided.

Iowa has two natural areas in this reach. Turkey River Mounds, a geological, archaeological and biological resource, is at the confluence of the Turkey River. A ridge rises 1,000 feet above the Mississippi and Turkey River Valleys and includes 43 burial mounds built by Late Archaic and Woodland people. Relics date between 500 B.C. and 900 A.D. Plant communities are mesic and dry prairie and woodland. The site is on the National Register of Historic Places (Fleckenstein, 1992).

Catfish Creek Preserve, near Rockdale, Iowa has interesting geologic features, an archaeological record from Paleo-Indian times, significant hill prairies, and upland and lowland forest. This was the site of Julien Dubuque's lead mining operation in 1788. He was the first white settler in the area (Fleckenstein, 1992).

Wisconsin also has two natural areas in this reach. Twelve-mile island is a large rookery area and is host to furbearers and waterfowl. It is an important sport and commercial fishing area. Bertom Lake Woods Natural Area is also a heron rookery site; shorebirds, waterfowl, beaver, and muskrat inhabit the area. The area is also used as a nesting site by a Federally-endangered raptor (USFWS, 1987).

Table 2.9-7

**NATURAL AREAS
MISSISSIPPI RIVER: GUTTENBERG - MUSCATINE**

Natural Areas	State	County	Pool	Type	Acres
Twelve-Mile Island Natural Area	WI	Grant	11	ND	ND
Bertom Lake Woods Natural Area	WI	Grant	11	ND	ND
Turkey River Mounds State Preserve	IA	Clayton	11	S	62
Catfish Creek	IA	Dubuque	12	S	600
Essential Algific Slope	IL	Jo Daviess	12	S	ND
Mississippi Palisades	IL	Carroll	13	S	448
Savanna Army Depot	IL	Jo Daviess	13	S	394
Thomson-Fulton Sand Prairie	IL	Whiteside/Carroll	13	S/F	394
Prairie Traits Natural Heritage Landmark	IL	Whiteside	14	S	ND
Oak Valley Eagle Refuge	IL	Rock Island	14/15	S/P	705
Loud Thunder Forest Preserve	IL	Rock Island	16	S	ND
Total Identified Acreage					2,603

Type: Federal (F), State (S), Private (P) ND = No Data

Nine natural areas are listed for the state of Illinois in this reach. One area, Essential Algific Slope, is a significant statewide natural area and also an Illinois Heritage landmark. Located in Joe Daviess County, it provides habitat for a Federally endangered snail. Mississippi Palisades is a national natural landmark north of Savanna (NPS, 1994). This state-owned significant geologic area is an exposure of the Silurian System with V-shaped sinks and massive cliffs along the Mississippi. Savanna Army Depot is a statewide significant bottomland and sand terrace area. The area features high quality sand prairie, a heron rookery and habitat for state-endangered plants and animals. Bottomlands serve as a winter roost for bald eagles.

Thompson-Fulton Sand Prairie near Lock and Dam 13 serves as a native preserve and Federal research natural area. The area features dry-mesic sand prairie, sand blowouts, dunes, and habitat for a state-endangered plant and state-endangered reptile. Prairie Traits Natural Heritage Landmark, near Clinton, features sand prairie habitat. Oak Valley Eagle Refuge north of East Moline is a statewide significant area. Large ravines in the steep bluffs along the river serve as winter roosting areas for bald eagles (Illinois Natural History Survey, 1995). Loud Thunder Preserve is a statewide significant area that is habitat for an endangered clubmoss.

2.9.8 Recreation Areas

This study reach contains 39 major recreation areas; 26 are in Iowa. Ten of the recreation areas are Federally-owned. State parks and recreation areas account for 8 of the 39 recreation areas; 21 are locally owned. Camping, picnicking, and water activities were the most commonly available recreational opportunities along this study reach. Hunting/fishing and hiking/biking activities were less common. The 39 recreation areas and the activities which they provide are listed in Table 2.9-8.

Mississippi Palisades State Park is the largest state recreation area in this reach; it is north of Spring Lake in Carroll County. The state park had a 1992 attendance figure of 625,367 people. Wildlife inhabiting the park include pileated woodpeckers and migratory waterfowl, in addition to plants such as paper birch trees and ferns (Illinois Natural History Survey, 1995).

Nelson Dewey State Park, west of Cassville in Grant County, Wisconsin, has an average annual attendance of 80,000 people. Within the Nelson Dewey area is the Stonefield Historic Site, which is comprised of Stonefield Village, the State Agricultural Museum, and the Nelson Dewey Homesite. Also within the park are many prehistoric sites and the Dewey Heights Prairie, a dry, limy prairie established in 1952 (Wisconsin DNR, 1991).

Bellevue State Park, located south of the town of Bellevue in Jackson County, Iowa, contains a nature center, 52 campsites, and a butterfly garden. Recreational opportunities include nature trails, hiking trails, river fishing, and snowmobiling (Sportman's Atlas Co., 1994).

The Mines of Spain State Recreation Area, south of Dubuque in Dubuque County, Iowa, has much natural and historic importance. The area is frequented by deer and turkey, and provides a nature center, trails, and opportunities for hunting (Sportsman's Atlas Co., 1994).

Turkey River Mounds State Monument Park, located southeast of Guttenberg in Clayton County, Iowa, is within the 82-acre Turkey River Mounds State Preserve, a forested ridge with many Indian Mounds (Sportsman's Atlas Co., 1994).

Table 2.9-8

RECREATION AREAS
MISSISSIPPI RIVER: GUTTENBERG TO MUSCATINE

Recreation Area	State	County	Pool	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Guttenberg Municipal Park	IA	Clayton	11	ND	L	—	X	—	—	—
River Front Park	IA	Clayton	11	ND	L	—	—	—	—	X
Finley's Landing	IA	Dubuque	11	116	L	X	X	X	X	X
Mud Lake Creek	IA	Dubuque	11	57	L	X	X	X	—	X*
Mill Creek Park	IA	Clayton	11	32	L	—	X	X	—	—
Turkey River Mounds State Park	IA	Clayton	11	4	S	X	—	—	—	—
Eagle Point Park	IA	Dubuque	12	ND	L	—	X	—	—	—
Riverview City Park	IA	Dubuque	12	ND	L	X	X	—	—	X
Mines of Spain State Recreation Area	IA	Dubuque	12	1,260	S	—	—	X	X	X
Massey County Conservation Board Park	IA	Dubuque	12	ND	L	—	X	—	—	X*
Spruce Creek Park	IA	Jackson	12	43	L	X	X	X	—	X*
Bellvue State Park	IA	Jackson	12	547	S	X	X	X	X	X*
Duck Creek Park	IA	Jackson	13	2.5	L	X	X	X	—	X
Pleasant Creek Recreation Area	IA	Jackson	13	32	F	X	X	—	—	X*
South Sabula Lakes Park	IA	Jackson	13	14	S	X	X	X	—	X*
Bulger's Hollow Public Use Area	IA	Clinton	13	ND	F	X	—	—	—	X*
Eagle Point Park	IA	Clinton	14	ND	L	—	X	—	—	X
Riverview Park	IA	Clinton	14	ND	L	—	X	—	—	X
Rock Creek Park	IA	Clinton	14	75	L	X	X	X	X	X*
Princeton Public Use Area	IA	Scott	14	1,178	S	X	X	X	—	X
LeClaire Park	IA	Scott	16	ND	L	—	X	X	—	—
Credit Island Park	IA	Scott	16	ND	L	—	X	—	—	—
Clark's Ferry Recreation Area	IA	Muscatine	16	8	F	X	X	X	—	X*
Shady Creek Recreation Area	IA	Muscatine	16	15	F	X	X	—	—	X*
Izaak Walton League Park	IA	Muscatine	16	ND	L	—	X	X	—	X*
Fairport Public Use Area	IA	Muscatine	16	17	S	X	—	X	—	X*
Blanding Landing Recreation Area	IL	Jo Daviess	12	ND	F	X	—	—	—	X*
Mississippi Palisades State Park	IL	Carroll	13	2,505	S	X	—	X	—	X*
Big Slough Public Use Area	IL	Carroll	13	ND	F	X	—	—	—	X*
Thomson Causeway Recreation Area	IL	Carroll	13	ND	F	X	X	—	—	—
Lock & Dam 13 Public Use Area	IL	Whiteside	13	ND	F	—	X	X	—	—
Fisherman's Corner Public Use Area	IL	Rock Island	14	ND	F	X	—	—	—	—
Illiniwek Forest Preserve	IL	Rock Island	15	ND	L	—	—	—	—	X*
Sunset Park	IL	Rock Island	16	ND	L	—	X	—	—	X*
Loud Thunder Forest Preserve	IL	Rock Island	16	ND	L	—	—	—	—	X*
Nelson Dewey Memorial State Park	WI	Grant	11	756	S	X	X	—	X	X
Furnace Branch Public Use Area	WI	Grant	11	ND	L	—	—	—	—	X
Berton Lake Public Area	WI	Grant	11	ND	L	X	—	—	—	X*
Grant River Recreation Area	WI	Grant	11	ND	F	X	X	—	—	X*
Total Identified Acreage				6,661.5						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

2.9.9 Data Gaps

The wetland coverage was approximately 92 percent. This data was extrapolated proportionately to provide an estimate of the wetlands acreage within the reach.

2.9.10 References Cited

- Ackerman, G.L. 1976. *in* Eckbald, J.W. 1986.
- Ackermann, G. and R. DeCook. 1992. *Commercial Harvest of Freshwater Mussels in Iowa*. Des Moines, IA.
- American Park Network. 1994. *Illinois State Parks Magazine*.
- Bellrose, F.C. 1976. *Ducks, Geese, and Swans of North America*.
- Bertrand, B.A., and T. Miller. 1973. *in* Eckbald, J.W. 1986.
- Boland, T. and T. McCarthy. 1992. *Mississippi and Missouri Rivers Commercial Fishing Report, 1992*. Iowa Department of Natural Resources. Des Moines, IA.
- Boland, T., and Reetz. 1979. *in* Eckbald, J.W. 1986.
- Breitenbach, R. and Peterson, G. 1980. *Fish and Wildlife Management Work Group Appendix: Great River Environmental Action Team, GREAT II, Upper Mississippi River*. U.S. Fish and Wildlife Service. Rock Island, IL.
- Eckbald, J.W. 1986 *The Ecology of Pools 11-13 of the Upper Mississippi River: A Community Profile*. U.S. Fish and Wildlife Service. Biol. Rep. 85 (7.8).
- Fleckenstein, J. 1992. *Iowa State Preserves Guide*. Iowa Department of Natural Resources, Des Moines, IA.
- Illinois Natural History Survey. 1995. *Illinois GIS database; unpublished report of Illinois Natural Areas*. Champaign, IL.
- Konrad, M. 1994. *Correspondence*. Iowa Department of Natural Resources. Des Moines, IA.
- National Park Service, Sept. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance*.
- Peterson, Gail A. 1984. *Resources Inventory for the Upper Mississippi River (Guttenberg, Iowa to Saverton, Missouri)*. Prepared for U.S. Army Corps of Engineers, Rock Island District, Rock Island, Illinois.
- Riley L. and Riley, W., 1993. *Guide to the National Wildlife Refuges*. MacMillan Publishing Company. New York, NY.

Floodplain Management Assessment

Sportsman's Atlas Co. 1994. *Iowa Sportsman's Atlas*. Lytton, IA.

U.S. Army Corps of Engineers. 1980. *Great I - A Study of the Upper Mississippi River*.

U.S. Fish and Wildlife Service. 1978. *Mammals of the Upper Mississippi Wildlife and Fish Refuge*. Brochure. Washington, D.C.

U.S. Fish and Wildlife. 1976-1992. *The Upper Mississippi River Wildlife and Fish Refuge, Pools 4-14 Maps*.

U.S. Fish and Wildlife Service. 1987. *Resource Classification System; Upper Mississippi River National Wildlife and Fish Refuge*.

U.S. Fish and Wildlife Service. 1991. *Birds of the Upper Mississippi Wildlife and Fish Refuge*. Brochure. Winona, MN.

Van Vooren, A. 1983. *in* Eckbald, J.W. 1986. *The Ecology of Pools 11-13 of the Upper Mississippi River: A Community Profile*. U.S. Dept. of Interior and U.S. Dept. of the Army.

Wisconsin Department of Natural Resources. 1991. *Nelson Dewey State Park Visitor*. Madison, WI.

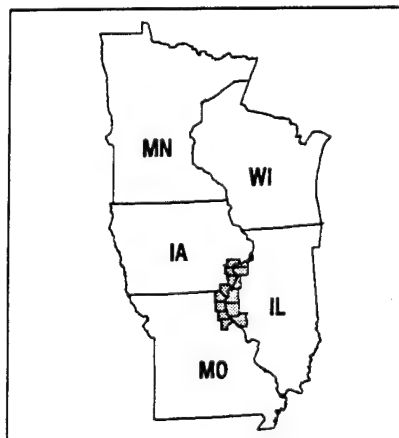
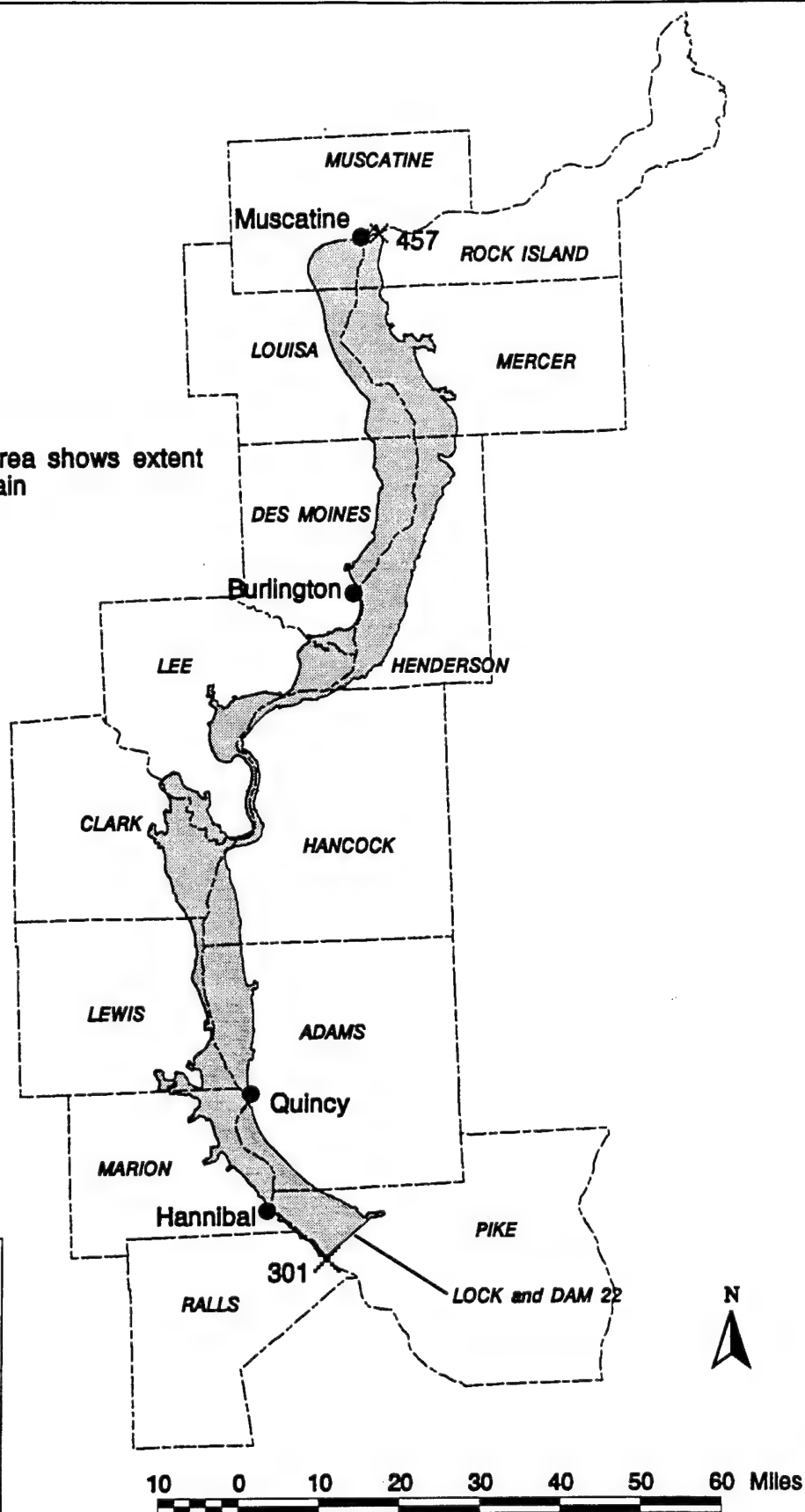
2.10 MISSISSIPPI RIVER: MUSCATINE, IOWA TO HANNIBAL, MISSOURI

This segment of the Mississippi River is from north of Muscatine, Iowa south, to a point below Hannibal, Missouri (see Figure 3-10). It is approximately 156 river miles in length. The river landmarks are Lock and Dam 16 (RM 457) at the upper end and Lock and Dam 22 (RM 301) at the lower end. This section of the Mississippi River adjoins three states: Illinois, Iowa and Missouri. Major communities located along this segment include: Quincy, Illinois; Hannibal, Missouri; and Muscatine, Burlington, and Keokuk, Iowa. The Des Moines River and the Iowa River are the primary tributaries entering the Mississippi River along this reach.

2.10.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.10-1. Descriptions of the state soil associations are provided in Appendix A.

Shaded area shows extent of floodplain



Key Map

Figure 2-10
Mississippi River:
Muscatine, Iowa to Hannibal, Missouri

Table 2.10-1

**SOIL ASSOCIATIONS
MISSISSIPPI RIVER: MUSCATINE - HANNIBAL**

Soil Association	State	Occurrences	Acres	Percent
FAYETTE-DOWNS-LINDLEY	IA	4	1,770	<1
COLO-NODAWAY-ZOOK	IA	4	34,550	7
BEAUCOUP-LAWSON-DARWIN	IL	6	173,550	33
FRUITFIELD-ELRICK-TOOLESBORO	IA	2	17,290	3
SEATON-LACRESCENT-LAWSON	IL	8	2,660	<1
PLAINFIELD-SPARTA-OAKVILLE	IL	4	36,910	7
WORTHEN-LITTLETON-ELBURN	IL	3	14,180	3
ROZETTA-FAYETTE-HICKORY	IL	21	3,540	<1
SAWMILL-GENESEE-LAWSON	IL	1	9,690	2
TAMA-MUSCATINE-GARWIN	IA	2	<10	<1
TITUS-WABASH-ROWLEY	IA	1	48,110	9
PORT BYRON-JOY-SEATON	IL	7	510	<1
CLINTON-LINDLEY-KESWICK	IA	10	1,310	<1
SEATON-HICKORY-MT.CARROLL	IL	10	4,370	<1
GILFORD-MAUMEE-SPARTA	IL	1	9,860	2
LINDLEY-WELLER-KESWICK	IA	17	6,620	1
NODAWAY-LAWSON-COLO	IA	4	44,550	9
ROZETTA-KEOMAH-HICKORY	IL	2	1,860	<1
LINDLEY-KESWICK-GOSS	MO	14	3,580	<1
CARLOW-PORTAGE-CHEQUEST	MO	8	85,590	16
LANDES-SPARTA-EXCELLO	MO	2	10,410	2
NODAWAY-LAWSON-COLO	MO	1	360	<1
WAKELAND-BIRDS-BELKNAP	IL	4	7,920	2
FATIMA-ARBELA-VESSER	MO	4	820	<1
MENFRO-WINFIELD-WELLER	MO	18	3,140	<1
SOIL ASSOCIATIONS SUB TOTAL	--	158	523,160	100
UNCLASSIFIED AQUATIC	ALL	3	74,900	--
SOILS AND AQUATIC TOTAL	--	--	598,050	--

2.10.2 Land Use/Land Cover

2.10.2.1 Land Use

The total area of floodplain within this reach covers almost 600,000 acres (Table 2.10-2). The urban areas within this reach are all relatively small, with populations of less than 50,000. Quincy, Illinois, the largest city in the reach, had a 1990 population of approximately 45,000. Numerous industries are along the river. These include grain elevators, power companies, fertilizer plants, and barge loading and docking areas. (Breitenbach and Peterson, 1980).

Table 2.10-2

**LAND USE/LAND COVER
MISSISSIPPI RIVER: MUSCATINE - HANNIBAL**

Cover Type	Acres	Percent
Urban	17,450	3
Agriculture	417,000	70
Upland Forest	610	< 1
Forested Wetland*	60,320	12
Non-forested Wetlands	25,510	2
Water	76,820	13
Barren	340	< 1
Total	598,050	100

*Extrapolated from partial coverage.

The most productive farmland soil on the floodplain is characteristically well-drained. Lands adjacent to the river are farmed extensively when protected by a levee system.

2.10.2.2 Vegetation

Forested wetlands are on islands within the river and within the floodplain on the river side of the levees. These areas have not been cleared and are subject to periodic flooding. The plant communities reflect the amount or frequency of inundation. The floodplain forest communities are primarily elm-ash-cottonwood-river birch-silver maple forests. Elm has diminished in status, now making up only about one percent of the forest. The oak-hickory forest contains the major mast-producing species common to this portion of the river (Breitenboch and Peterson, 1980). The dominant species of this medium-tall to tall broadleaf deciduous forest include bitternut hickory, shagbark hickory, white oak, red oak, and black oak (Küchler, 1975). Upland forest areas are adjacent to the river on bluffs and well-drained land; they are typically small woodlots.

2.10.2.3 Plant Species of Special Concern

Sixteen protected plant species have been observed along this stretch of river. The majority of the protected species are wildflowers. None of the species have Federal protection. Four endangered and three threatened species are in the Iowa portion of the reach. Five endangered species are in the Illinois portion of the reach; seven are in the Missouri portion of the reach. Also in the Missouri portion, two rare species have been noted. The plants are listed in Table 2.10-2a.

Table 2.10-2a

**PROTECTED PLANT SPECIES OF THE MISSISSIPPI RIVER
MUSCATINE - HANNIBAL**

Species	Federal Status	Iowa Status	Illinois Status	Missouri Status	Site Occurrences by County
Crested Fern	--	--	--	E	Clark
Curved-pod Corydalis	--	E	T	--	Louisa Muscatine
Dotted Monarda	--	--	--	E	Clark (7)
Dwarf Dandelion	--	E	--	--	Des Moines Louisa (2)
Flaxleaf Aster	--	T	--	--	Louisa
Green Arrow Arum	--	E	--	R	Des Moines
Hairy Gramma	--	--	--	R	Clark
Marsh Skullcap	--	--	--	E	Clark
Meadow Horsetail	--	--	E	E	Clark
Patterson Bindweed/Pickering Morning Glory	--	E	E	E	Clark
Plains Violet	--	--	E	--	Adams
Salt Meadow Grass	--	--	E	--	Pike
Showy Lady's Slipper	--	T	E	--	Muscatine
Slender Dayflower	--	T	--	--	Louisa Muscatine
Spotted Joe - Pye Weed	--	--	--	E	Clark
Willow Herb	--	--	--	E	Clark

E = listed as endangered **T** = listed as threatened **R** = rare (comparable to threatened)

2.10.3 Aquatic Resources

2.10.3.1 Wetlands

Within this reach, approximately 44,620 acres of vegetated wetland are in the adjacent floodplain. The majority are classified as forested wetland (Table 2.10-3).

Table 2.10-3

AQUATIC RESOURCES¹
MISSISSIPPI RIVER: MUSCATINE - HANNIBAL

Wetland Class	Acres	Percent
Forested	60,320	84
Shrub/Scrub	4,100	6
Emergent	7,550	10
Water Resources	Acres	Number
Lakes & Ponds	8,090	300

¹Extrapolated from 62 percent coverage.

The majority of the wetland area located within this river segment is toward the northern end of the reach. Large forested wetland habitats are on several islands that have formed within the channel of the Mississippi. Major islands containing significant wetland areas include:

Island	River Mile
Kilpeck Island	447
Bogus Island	443
Turkey Island	438
Otter Island	408
Burlington Island	399
Buzzard Island	350
La Grange Island	338
Long Island	335

Large parcels of forested wetland areas are found within the various parks and management units along this reach. These wetland systems have been able to persist primarily due to the absence of human activity in these areas. The Mark Twain National Wildlife Refuge, for example, contains a high diversity of wildlife habitats. Large areas of forested wetland surrounded by smaller pockets of

emergent and shrub/scrub wetland are within a heterogenous mosaic of lakes, ponds, and sloughs. In addition, the 700-acre Klum Lake SWMA, south of Muscatine, Iowa, is dominated by emergent and forested wetland ecosystems. Near Burlington, Iowa a large island/slough/forested wetland complex forms a unique natural resource feature within the floodplain.

2.10.3.2 Lakes and Ponds

Approximately 300 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 8,090 acres. Many of the water bodies have small (less than 5 acres) surface areas. The average size of all ponds and lakes is approximately 27 acres. Lakes and ponds, their location and river mile are listed below:

Lake	Location	River Mile
Spring Lake	Fruitland, IA	449
Beattys Pond	Fruitland, IA	449
Swan Lake	N. of New Boston, IL	442
Lake Odessa	E. of Wapello, IA	441
Goose Pond	New Boston, IL	430
Willow Lake	N. of Oquaka	420
Crystal Lake	E. of Burlington, IA	406
Orchard City Lake	E. of Burlington, IA	404
Carthage Lake	E. of Burlington, IA	403
O'Farre Lake	N. of Canton, IA	348
Canton Chute	Canton, IA	342
Sand Lake	Marblehead, IL	319
Bay de Charles	Mungers, IA	319

Some of the larger water bodies within the river segment are: Bay DeCharles, Beattys Pond, Carthage Lake, Crystal Lake, Goose Pond, Lake Odessa, Sand Lake, Spring Lake, Sturgeon Bay, Swan Lake, and Willow Lake. The largest of these water bodies is Lake Odessa (approximately 1,300 acres), which is located in the Mark Twain National Wildlife Refuge east of Wapello, Iowa. It includes important habitat for river otters and other wildlife. Approximately 10 river miles north of the Klum Lake SWMA, a complex of 17 oxbow lakes and associated ponds comprise a matrix containing over 250 acres of open water.

2.10.3.3 Tributaries

Several tributaries empty into the Mississippi River within this reach. Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

2.10.4 Fisheries

This reach of the Mississippi River supports a rich diversity of fish and mussel fauna and healthy populations of most native species. Jahn and Anderson (1987) report that 65 fish species are present in Pools 19 and 20. The Great II studies (Breitenbach and Peterson, 1980), reported that 102 fish/aquatic species are known to occur in the stretch of the Mississippi River between Pools 11 and 22 (Great II project area). Gizzard shad, freshwater drum, and carp were found to be the most abundant. For further reference, Van Vooren (1983) provides a table showing the distribution and relative abundance of fish in the Great II project area.

Approximately 30 species support the sports fishery of the Upper Mississippi River (Pools 11 to 22) (Breitenbach and Peterson, 1980). Major gamefish in the Mississippi River include the walleye, sauger, channel catfish, largemouth bass, bluegill, and crappie (Konrad, 1994). Other game fish sought by anglers in this reach of the Mississippi include the white bass, paddlefish, carp, flathead catfish, bullhead, and freshwater drum. The Great II study found bluegill, crappie, white bass, largemouth bass, bullhead, freshwater drum, and carp were the major gamefish sought by anglers in Pools 11 through 22.

Commercial fishing on the Upper Mississippi River has occurred since the early 1800's. From 1953 to 1977, the commercial catch in the Great II project area was approximately 113 million pounds, worth approximately \$9,900,000. Jahn and Anderson (1987) reported the area from Pool 16 to 20 as one of the four major fishing grounds in the Upper Mississippi. The four major species caught in this region are catfish, buffalo, carp, and freshwater drum. The Great II study found that these four major species dominated the Upper Mississippi River commercial catch (95 percent) from 1953 through 1977. Minor species caught commercially include bullhead, gar, crappie, eel, bowfin, and sturgeon. Trammel nets and seines are the primary fishing gear used.

Commercial fishing for mussels within this reach occurs primarily in Pools 19 and 16. In 1992, 49,571 pounds of mussels were harvested in Pool 19 (Ackerman and DeCook, 1992). Harvested amounts in Pools 16, 17, and 18 were smaller; 22,612 pounds, 2,249 pounds and 1,389 pounds respectively. Pool 19 is recognized as one of five pools in the upper Mississippi River with substantial mussel populations (Breitenbach and Peterson, 1980). The primary mussel species collected are the washboard and the threeridge. Smaller numbers of mapleleaf, pigtoe, and pink heel splitter are collected.

2.10.4.1 Aquatic Species of Special Concern

Thirteen aquatic species with protected status are in this reach of the Mississippi River (Table 2.10-4). Six of these species are mussels and seven are fish. Only two species, the Higgins' Eye Pearly Mussel and the fat pocketbook mussel, have Federal protection under the Endangered Species Act. The remainder of the protected species are listed as threatened or endangered by at least one of the three states.

Pools 17, 18 and 19, respectively contain the highest number of protected species (Table 2.10-4). Federally-protected species occur within all pools except Pool 21. Several protected mussels are within the existing mussel sanctuaries in the Mississippi River: the Cedar Glen Sanctuary in Pool 20,

the Pontoosuc Sanctuary in Pool 19, and the Mississippi River New Boston Mussel Sanctuary in Pool 18.

Table 2.10-4

**PROTECTED AQUATIC SPECIES OF THE MISSISSIPPI RIVER
MUSCATINE - HANNIBAL**

Species	Federal Status	Iowa Status	Illinois Status	Missouri Status	Site Occurrences by County
Butterfly Mussel	--	T	T	--	Pike, Adams, Henderson, Mercer(2)
Central Mudminnow	--	--	--	E	Clark(2)
Ebonyshell Mussel	--	--	T	E	Adams, Mercer
Fat Pocketbook Mussel	E	--	E	E	Clark, Pike, Hancock(2)
Grass Pickerel	--	T	--	--	Louisiana
Higgins' Eye Pearly Mussel	E	E	E	E	Des Moines(2), Louisiana(3), Muscatine, Marion, Mercer, Rock Island(2), Henderson(3)
Lake Sturgeon	--	E	E	E	Muscatine, Marion, Henderson, Hancock, Rock Island, Mercer
Mooneye	--	--	--	R	Marion
Northern Pike	--	--	--	E	Clark, Lewis
Sheepnose/Bullhead Mussel	--	E	E	R	Hancock, Mercer
Spectaclecase Mussel	--	E	E	--	Rock Island, Henderson, Hancock(2), Mercer(2)
Weed Shiner	--	E	E	--	Henderson
Western Sand Darter	--	T	E	--	Des Moines

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

2.10.4.2 Important Aquatic Habitat

This segment of the river contains three mussel sanctuaries, six important tailwater fisheries, and numerous important aquatic habitats. The Mississippi River New Boston Mussel Sanctuary is in Pool 18. Two additional mussel sanctuaries are Cedar Glen Sanctuary in Pool 20 and Pontoosuc Sanctuary in Pool 19. All three support a diverse population of native mussels, including those protected by nearby states.

Important tailwater fisheries exist below each lock and dam. In general, the tailwaters contain important sport and commercial fisheries. Important sport and commercial fisheries are located throughout the river. In general, these fisheries are associated with island chutes, backwater complexes, side channels, sloughs, islands, and mouths of incoming streams.

2.10.5 Wildlife

The Upper Mississippi River corridor is utilized by at least 5 million waterfowl each year (Bellrose, 1979). Important diving ducks utilizing Pools 19 and 20 include lesser scaup, canvasback, ringneck, goldeneye, and mergansers (Jahn and Anderson, 1987). Of these, the scaup and canvasback are most numerous. The Great II study area is also utilized by migratory songbirds, wading birds, shorebirds, and waterbirds. Common species include warblers, sparrows, broad winged hawks, herons, egrets, and wild turkeys. The bald eagle is common in this area from October through March.

Fifty-two mammals were identified in the Great II area. Common mammals found include white-tailed deer, beaver, cottontail rabbit, mink, raccoon, striped skunk, gray fox, and muskrat. Other common species include red fox, fox and grey squirrels, eastern mole, least shrew, white footed mouse and voles (Breitenbach and Peterson, 1980).

Less is known about the amphibians and reptiles along the river. Jahn and Anderson (1987) report that 56 species of amphibians and reptiles possibly reside in Pools 19 and 20. The Great II studies reported 61 species may inhabit the overall study area. Species likely present in this reach include smallmouth, dark-sided, and eastern salamanders; and chorus, green, pickerel, and wood frogs. The two most common turtles in the Great II project area are the common snapping turtle and the western painted turtle. The six-lined racerunner is the only common lizard, although other lizard species may occur.

Mammal species hunted in this reach include rabbit, fox and grey squirrel, fox, raccoon, white-tailed deer; and coyote. The Great II study reported that approximately 160,000 squirrels were harvested annually in the Great II project area. The annual harvest of cottontail rabbit was even greater, approximately 186,000. The raccoon is the most abundant furbearer harvested in the Great II project area. Other furbearers harvested include muskrat, mink, fox, opossum, coyote, and beaver. A total of 112,000 waterfowl were harvested within the Great II project area in 1979 (Breitenbach and Peterson, 1980).

2.10.5.1 Wildlife Species of Special Concern

Seventeen species of wildlife within this study reach have protective status either Federally under the Endangered Species Act or by the states (Table 2.10-5). Only two species, the bald eagle and the Indiana bat are Federally protected. The remainder are protected in one or more of the states bordering the reach. The bald eagle, Federally-listed as endangered in Iowa, Illinois and Missouri, is common throughout much of the area during the winter months. The Indiana bat is known to be near Pools 18 and 21.

Table 2.10-5

**PROTECTED WILDLIFE SPECIES OF THE MISSISSIPPI RIVER
MUSCATINE - HANNIBAL**

Species	Federal Status	Iowa Status	Illinois Status	Missouri Status	Site Occurrences by County
Bald Eagle	E	E	E	E	Clark(2), Adams, Hancock, Henderson(4), Mercer(2), Pike, IL
Blanding's Turtle	--	--	--	E	Clark(2)
Brown Creeper	--	--	T	--	Adams
Central Newt	--	T	--	--	Louisa
Diamondback Watersnake	--	T	--	--	Lee, Louisa
Great Egret	--	--	T	R	Rock Island, Adams, Henderson(4), Hancock(2), Mercer(2)
Illinois Mud Turtle	--	E	E	E	Lee, Louisa, Clark(3), Henderson
Indiana Bat	E	E	E	E	Louisa, Adams
Mississippi Kite	--	--	E	R	Adams, Pike, IL
Ornate Box Turtle	--	T	--	--	Louisa
Osprey	--	--	E	--	Adams
Plains Pocket Mouse	--	E	--	R	Muscatine, Clark
Red-Shouldered Hawk	--	E	E	--	Louisa
River Otter	--	T	E	--	Pike(2), Adams, Hancock, Henderson(3)
Western Fox Snake	--	--	--	E	Clark(2)
Western Hognose Snake	--	E	T	--	Louisa
Yellow Belly Watersnake	--	E	--	--	Louisa

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

The highest number of protected species occurs in Pool 20. Federally protected species occur near all pools except Pool 22. Most of the non-Federal species are amphibians and reptiles. Two state-protected mammals and two state-protected birds also occur in this reach.

2.10.5.2 Important Wildlife Habitat

Heron rookeries, bald eagle habitats, and essential river otter habitats are the primary valuable wildlife habitats within this reach. Heron rookeries are located throughout the reach. Bald eagle perching and roost habitats are primarily in Pools 19 and 20. The Cedar Glen Roost is south of

Hamilton, Illinois. Pool 19 is one of the largest winter sanctuaries for bald eagles (Peterson, 1984). Pool 20 provides valuable habitat for diving ducks.

Portions of the Mark Twain National Wildlife Refuge (MTNWR) in Pools 17, 18, and 21 provide essential river otter habitat, bald eagle habitat, and quality wildlife habitat. The important wildlife habitats include Cottonwood Island in Pool 21 which provides important deer and wild turkey habitat; Gladstone Lake in Pool 18 which provides important habitat for the protected Illinois mud turtle; and the Big Sand Mound Natural Area in Pool 17.

2.10.6 Fish and Wildlife Management Areas

This study reach contains 18 major FWMAs (Table 2.10-6). Federal wildlife refuges account for 5 of the 18 FWMAs; the remaining 13 areas are state-owned. Approximately 30,947 acres of the land and water located in this reach are managed by Federal and state agencies for wildlife production and protection (USCOE, 1980).

The MTNWR, near Quincy, Illinois, is a Federal refuge along the Mississippi River for 250 miles through Iowa, Illinois, and Missouri. However, this study reach only contains portions of the refuge, including the Big Timber, Louisa, Keithsburg, Horseshoe Bend and Gardner Divisions in Illinois and Iowa. Bald eagles, great blue heron, great egrets, and several thousand waterfowl use the refuge for some portion of a year. Wildlife that frequent the area include wild turkeys, golden warblers, foxes, beavers, and coyotes. The Louisa Division of the refuge contains a bald eagle feeding and perching area. The Gardner Division receives bald eagle use depending on the weather (Riley and Riley, 1993).

The Henderson County State Conservation Area, southwest of Monmouth in Henderson County, Illinois, provides opportunities for fishing, picnicking, camping, boating, and winter sports (APN, 1994).

The Anderson (Edward) Conservation Area, south of the town of Louisiana in Ralls and Pike Counties, Missouri, permits hunting of small game, turkey, and deer, and provides camping facilities. Buck and Doe Run Conservation Area is in Clark County, Missouri. Hunting of small game, waterfowl, turkey, and deer is permitted, with fishing and camping also available.

Ray (J. Thad) Memorial Wildlife Area is west of Hannibal in Marion County; hunting of small game, deer, and turkey is allowed. The area provides facilities for camping and archery also. Steyermark (Julian) Woods Conservation Area, north of Hannibal is a wildlife refuge only. Odessa Wildlife Area, in Louisa County, Iowa, provides habitat for the Iowa-threatened river otter.

Table 2.10-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MISSISSIPPI RIVER: MUSCATINE - HANNIBAL**

Management Areas	State	County	Pool	Type	Acres
Louisa Refuge Area	IA	Louisa	17	S	ND
MTNWR (Big Timber Division)	IA	Louisa	17	F	3,376
MTNWR (Louisa Division)	IA	Louisa	17	F	3,338
MTNWR (Horseshoe Bend Division)	IA	Louisa	17	F	2,500
Odessa Wildlife Area	IA	Louisa	17	S	4,179
Klum Lake State Wildlife Management Area	IA	Louisa	17	S	ND
Allen Green State Wildlife Management Area	IA	Des Moines	18	S	ND
Blackhawk Bottoms State Wildlife Mgmt. Area	IA	Des Moines	18	S	ND
Burks Run State Wildlife Area	IA	Lee	19	S	ND
Henderson County State Conservation Area	IL	Henderson	18	S	88
MTNWR (Keithsburg Division)	IL	Mercer	18	F	ND
Oquakwa Refuge	IL	Henderson	18	S	319
Arthur Refuge	IL	Hancock	19	S	ND
MTNWR (Gardner Division)	IL	Adams	20	F	ND
Buck and Doe Run Wildlife Area	MO	Clark	20	S	192
Anderson (Edward) Wildlife Area	MO	Ralls	22	S	1,046
Ray (J. Thad) Memorial Wildlife Area	MO	Marion	22	S	148
Steyermark Woods Wildlife Area	MO	Marion	22	S	73
Total Identified Acreage					15,259

Type: Federal (F), State (S), Local (L)

ND = No Data

2.10.7 Natural Areas

This study reach contains seven major natural areas. One area, Mark Twain and Cameron Caves, is designated as a National Natural Landmark (NPS, 1994). The natural areas are listed by state in Table 2.10-7; acreage and approximate location by river pool and county is also permitted.

Table 2.10-7

**NATURAL AREAS
MISSISSIPPI RIVER: MUSCATINE - HANNIBAL**

Natural Areas	State	County	Pool	Type	Acres
Big Sand Mound Natural Area	IA	Louisa	17	P	ND
New Boston Marsh	IL	Mercer	18	S	985
New Crystal Lake Club	IL	Henderson	19	P	ND
Mississippi River Sand Hills Nature Preserve	IL	Hancock	20	ND	ND
Gardner Woods Nature Area	IL	Adams	21	ND	4,407
Fabius Island and North River	MO	Marion	22	ND	ND
Mark Twain and Cameron Caves	MO	Marion	22	F	ND
Total Identified Acreage					5,392

Type: Federal (F), State (S), Private (P) ND = No Data

Big Sand Mound Natural Area is south of Muscatine, Iowa. It contains habitat for some Iowa endangered species, including the Illinois mud turtle. It is the only major natural area listed for Iowa.

Four areas in Illinois are listed for this reach. New Boston Marsh is a high quality wetland that has been designated a significant statewide natural area. New Crystal Lake Club, a significant statewide area near O'Connell Island, contains high quality floodplain forest, marsh, and prairie. Mississippi River Sand Hills Nature Preserve is in the vicinity of Keokuk. This area contains an unusual geological formation of Kansas-aged sandstone deposits. Gardner Woods Natural Area, north of Quincy, contains floodplain forest.

Missouri has two significant areas listed in this reach. Fabius Island and North River in Marion county is an area of bottomland forest on the Missouri natural features inventory. Mark Twain and Cameron Caves is two miles southeast of Hannibal. This area is privately owned and exemplifies exceptional maze type cavern development. This is the only resource within this study reach that is listed as a National Natural Landmark (NPS, 1994).

2.10.8 Recreation Areas

This study reach contains 25 major recreation areas (Table 2.10-8). Five Federal recreation areas are within this study reach. State parks and forests account for five of the 25 recreation areas; the remaining 12 are local-owned. Camping, picnicking, and water activities were the most commonly available recreational opportunities within the study reach. Hunting/fishing and hiking/biking activities were less common. Within the Great II area, recreational use is projected to increase by 16 percent by the year 2000 and 21 percent by the year 2025 (Breitenbach and Peterson, 1980).

Table 2.10-8

RECREATION AREAS
MISSISSIPPI RIVER: MUSCATINE - HANNIBAL

Recreation Area	State	County	Pool	River Mile	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Riverside Park	IA	Muscatine	17	455.7	ND	L	--	X	--	--	X
Kilpeck Landing Public Use Area	IA	Louisa	17	447.0	ND	F	X	X	X	--	X*
Flaming Prairie Recreation Area	IA	Louisa	17	442.8	ND	L	X	--	--	--	X*
Ferry Landing Park	IA	Louisa	18	433.1	12	L	X	--	--	--	X*
4th Pumping Plant Recreation Park	IA	Des Moines	18	424.9	17	L	X	X	X	--	X*
Riverview Park	IA	Lee	19	383.0	40	L	--	X	X	--	X
Victory Park	IA	Lee	20	363.8	ND	L	X	X	--	--	--
Blanchard Island Public Use Area	IL	Rock Island	17	449.8	ND	L	X	X	X	--	X*
Crosses Corner Public Use Area	IL	Mercer	17	446.8	2	L	X	--	--	--	X*
Big River State Forest	IL	Henderson	18	424.2	2,895	S	X	--	X	X	--
Delabar State Park	IL	Henderson	18	417.6	89	S	X	--	X	X	X*
Henderson Creek Public Use Area	IL	Henderson	19	410.0	49	ND	--	X	--	--	X*
Navoo State Park	IL	Hancock	19	374.3	148	S	X	--	X	X	--
Montebello Park	IL	Hancock	20	364.0	3	L	--	X	--	--	X*
Meyer's Landing Ferry	IL	Adams	21	342.7	3	L	X	X	--	--	X*
Canton Chute Public Use Area	IL	Adams	21	331.5	ND	F	X	--	--	--	X*
Sid Simpson City Park	IL	Adams	21	328.7	ND	L	X	X	--	--	X*
Quinisippi Island City Park	IL	Adams	21	328.0	ND	L	--	X	--	--	X
Lock and Dam 21 Public Use Area	IL	Adams	22	324.5	ND	F	--	X	--	--	X*
Old Sny Channel Public Use Area	IL	Adams	22	313.8	ND	L	--	--	--	--	X
John Hay Public Use Area	IL	Pike	22	309.2	ND	F	X	X	--	--	X*
Fenway Landing Public Use Area	MO	Lewis	20	347.7	ND	S	X	X	--	--	X*
Lock and Dam 20 Recreation Area	MO	Lewis	21	343.4	ND	F	--	X	--	--	--
City of LaGrange Recreation Area	MO	Lewis	21	336.2	ND	L	--	X	--	--	X
Wakonda State Park	MO	Lewis	22	ND	1,050	S	X	X	X	--	X
Total Identified Acreage					4,308						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Big River State Forest is the largest recreation area (2,895 acres) in this study reach. South of Keithsburg, Big River State Forest had a 1992 attendance of 204,080 people. Within the forest lies the Lincoln Hiking Trail where, in 1832, Abraham Lincoln led a group of soldiers to fight during the Black Hawk War (APN, 1994).

Delabar State Park, north of Oquawka in Henderson County, Illinois, recorded a 1992 attendance figure of 174,075. The park provides recreational opportunities for camping, picnicking, hiking, and angling. Mature oak, birch, and hickory trees are throughout this heavily forested area (APN, 1994).

Navoo State Park, located east of Navoo, had the highest 1992 attendance (234,225 people) of Illinois state recreation areas within the study reach. The park provides a nature trail, a prairie plot, and a fishing lake (APN, 1994).

Wakonda State Park, south of LaGrange in Lewis County, Missouri, is the "largest natural sand beach and the only sand prairie in the Missouri state park system" (Missouri DNR, Undated). This state park contains a beach and six lakes and provides opportunities for canoeing, sailing, and fishing.

2.10.9 Data Gaps

Approximately 62 percent of the area had been mapped. The majority of the west side of the Mississippi River was not available, including all of the study area within Missouri and some of Iowa. To adjust for this gap, the acreage of forested wetlands was extrapolated from the available data. This extrapolated estimate was then subtracted from the land use/land cover data to derive an estimate of non-forested wetlands.

2.10.10 References Cited

- Ackermann, G. and R. DeCook. 1992. *Commercial Harvest of Freshwater Mussels in Iowa*. Des Moines, IA.
- American Park Network. 1993. *Illinois State Parks Magazine*.
- Bellrose, F.C., 1976. *Ducks, Geese, and Swans of North America*.
- Breitenbach, R. and Peterson, G. 1980. *Fish and Wildlife Management Work Group Appendix: Great River Environmental Action Team, GREAT II, Upper Mississippi River*. U.S. Fish and Wildlife Service. Rock Island, IL.
- Byrd, B. and Byrd, R. 1993. *Missouri Outdoor Atlas*. Warsaw, MO.
- Jahn, L.A. Anderson, R.U. 1987. *The ecology of Pool 19 and 20 of the Upper Mississippi River: An Ecological Profile*. U.S. Fish and Wildlife Service. Biological Report. Washington, D.C.
- Konrad, M. 1994. *Personal Communication*. Iowa Department of Natural Resources.
- Küchler, A.W. 1975. *Potential Natural Vegetation of the Conterminous United States*. American Geographical Society. New York, NY.
- Missouri DNR. Undated. *Wakona State Park brochure*. Missouri Department of Natural Resources. Jefferson City, Missouri.
- National Park Service, Sept. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance*.

National Park Service, Sept. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance.*

Peterson, G.A. 1984. *Resources Inventory for the Upper Mississippi River (Guttenberg, Iowa to Saverton, Missouri).* Prepared for U.S. Army Corps of Engineers, Rock Island District. Rock Island, IL.

Riley L., and Riley, W. 1993. *Guide to the National Wildlife Refuges.* MacMillan Publishing Company. New York, NY.

U.S. Army Corps of Engineers. 1980. *Great I - A Study of the Upper Mississippi River.*

Van Vooren, A. 1983. *in* Eckbald, J.W. 1986. *The Ecology of Pools 11-13 of the Upper Mississippi River: A Community Profile.*

2.11 IOWA RIVER

This study reach consists of the Iowa River (See Figure 2-11). It begins in Hardin County, is approximately 260 river miles in length, and ends where the Iowa River enters the Mississippi River. It adjoins ten counties in Iowa. The major communities located along this study reach are Marshalltown, Coralville, and Iowa City, Iowa. The Cedar River is the primary tributary that enters the Iowa River.

2.11.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.11-1. Descriptions of the state soil associations are provided in Appendix A.

Table 2.11-1

SOIL ASSOCIATIONS IOWA RIVER

Soil Association	State	Occurrences	Acres	Percent
COLO-NODAWAY-ZOOK	IA	9	194,280	74
TAMA-KILLDUFF-COLO	IA	33	5,750	2
FAYETTE-DOWNS-LINDLEY	IA	99	17,390	7
TAMA-MUSCATINE-GARWIN	IA	7	2,490	<1
DOWNS-TAMA-FAYETTE	IA	15	3,050	1
DINSDALE-TAMA-KLINGER	IA	7	1,110	<1
SPARTA-DICKINSON-CHELSEA	IA	24	22,600	9
CLINTON-LINDLEY-KESWICK	IA	19	7,590	3
OTLEY-ADAIR-LADOGA	IA	4	450	<1
TITUS-WABASH-ROWLEY	IA	3	8,830	3
LADOGA-GIVIN-HEDRICK	IA	1	140	<1
SOIL ASSOCIATIONS SUB TOTAL	--	221	263,680	100
UNCLASSIFIED AQUATIC	ALL	1	3,510	--
SOILS AND AQUATIC TOTAL	--	--	267,190	--

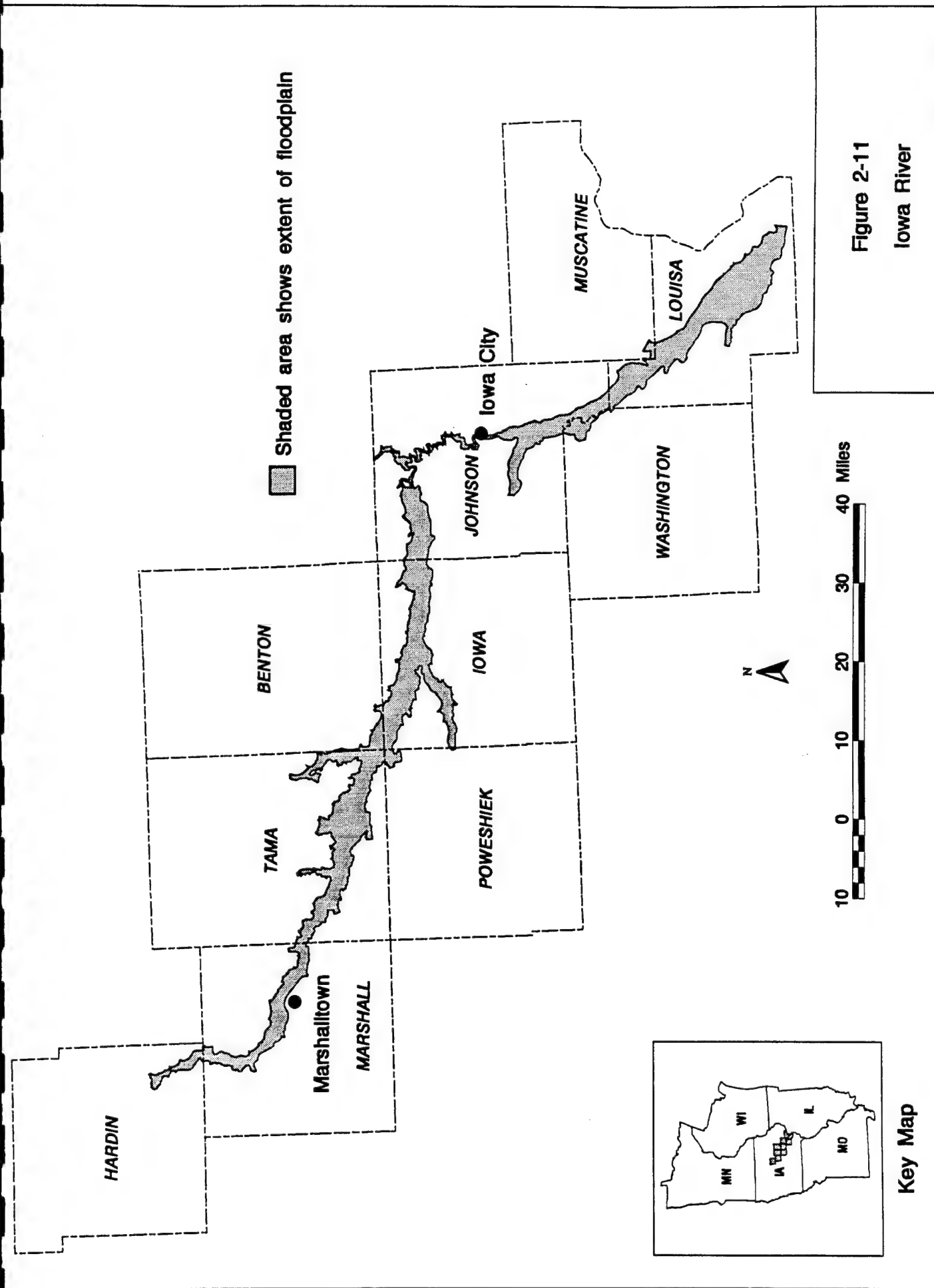


Figure 2-11
Iowa River

2.11.2 Land Use/Land Cover

2.11.2.1 Land Use

The total area of floodplain of this reach encompasses 267,190 acres (Table 2.11-2). The Iowa River passes through two urban areas, Iowa City and Marshalltown. A power plant and quarry are in the vicinity of Marshalltown. The remainder of the reach is rural with occasional small communities along the banks.

Table 2.11-2

LAND USE/LAND COVER IOWA RIVER

Cover Type	Acres	Percent
Urban	8,580	3
Agriculture	197,800	74
Forest	830	< 1
Wetland*	44,040	16
Water	15,660	5
Barren	280	< 1
Total	267,190	100

*No forested wetland data available.

The floodplain is narrow in Hardin County. It widens to between two and three miles around Marshalltown. Coralville Reservoir, an eight-mile lake, is north of Iowa City. Below the reservoir the river narrows and is a series of tight meanders. Between Iowa City and the confluence of the Cedar River the floodplain widens and includes a series of lakes. Large agricultural areas are located around Wapello, in Benton County, at the confluence of the Cedar River, and above Marshalltown.

2.11.2.2 Vegetation

The Iowa River is in the Western Corn Belt Plains ecological region. Bluestem prairie, consisting of bluestem, panic and Indian grass, is the primary native land cover (NPS, 1994).

Little forest is found in this reach. The largest forested areas are at the west end of Coralville Reservoir, in Tama County. Scattered areas of forest occur between Wapello and the Mississippi River. The floodplain forests are dominated by cottonwood, silver maple, and green ash (Iowa DNR, 1992).

2.11.2.3 Plant Species of Special Concern

Two plant species of special concern are found in Johnson County, Iowa (Table 2.11-2a). The brittle prickly pear is state-threatened. The eastern prairie fringed orchid is listed as Federally-threatened and state endangered. The curved-pod *Corydalis* is listed as state-endangered in Louisa County, Iowa.

Table 2.11-2a

PROTECTED PLANT SPECIES IOWA RIVER

Species	Federal Status	Iowa Status	Site Occurrences by County
Brittle Prickly Pear	--	T	Johnson
Curved-Pod <i>Corydalis</i>	--	E	Louisa
Prairie Fringed Orchid	T	E	Johnson

E = listed as endangered

T = listed as threatened

2.11.3 Aquatic Resources

2.11.3.1 Wetlands

Within this study reach, approximately 44,000 acres of vegetated wetland are in the adjacent floodplain, according to the land use/land cover data. The NWI data is insufficient to categorize the wetlands.

Based upon review of USGS maps, the largest concentration of wetlands is between Marengo and Iowa City. However, sizable wetland areas are also near the mouth of the Iowa River. A large emergent wetland area is located on the west side of the river, below Wapello. Little wetland area is along the study reach above Marengo. This is primarily due to the presence of more cultivated agricultural land.

Coralville Reservoir is a large river lake above Iowa City. Several bottomland forested areas surround the lake. Due to having a relatively small inundation zone, the reservoir bottom is dominated by palustrine forested and emergent wetlands.

2.11.3.2 Lakes and Ponds

Approximately 146 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 5,200 acres. The average size of each pond or lake is approximately 35 acres. Some of the larger lakes and their locations are listed below:

Lake	Location
Keevers Lake	S. of Wappello
Halls Lake	S. of Wappello
Spitznogle Lake	S. of Wappello
Warmstaff Lake	S. of Wappello
Muskrat Lake	S. of Wappello
Sportsman Lake	N. of Wappello

In addition to these larger lakes several smaller water bodies are interspersed throughout the study reach. A large conglomeration of ponds is on the east side of the river near Gladwin. Two of these waterbodies are oxbow lakes. A large oxbow lake is east of the river near Lone Tree. Four large lakes or ponds are east of Marengo. East of Chelsea, is a relatively large oxbow lake.

2.11.3.3 Tributaries

Several tributaries empty into the Iowa River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. A large forested wetland system is located at the confluence of the Cedar and Iowa Rivers. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Cedar River	Columbus Junction
English River	Riverside
Richland Creek	Chelsea
Salt Creek	Belle Plaine
Deer Creek	Toledo
Sugar Creek	Toledo

2.11.4 Fisheries

The Iowa River is an important environmental corridor in Iowa. The channel catfish is the major species of fish in the Iowa River. Minor species include flathead catfish, smallmouth bass, northern pike, walleye, and saugeye (walleye x sauger). Coralville Lake, formed by a dam on the Iowa River, provides an important sport and commercial fishery in central Iowa. According to Konrad (1994) major species in Coralville Lake include channel catfish and crappie. Minor species include white bass, largemouth bass, walleye, and saugeye. During the period 1986-1993, buffalo, carp, and river carpsucker dominated the commercial fishery in Coralville Lake (Conover, 1994). No mussel harvesting is allowed.

2.11.4.1 Aquatic Species of Special Concern

Five aquatic species with protected status are known to occur in this reach of the Iowa River (Table 2.11-4). Four of these species are mussels and one is a fish. None of the aquatic species known from this reach have Federal protection under the Endangered Species Act. Johnson County, Iowa, contains the most occurrences of protected species along this reach. The area below the Coralville reservoir in Johnson County is important for several state-protected mussel species. Five observations of the yellow sandshell, four observations of the strange floater, two observations of the bullhead mussel and one observation of the slough shell mussel have been reported from Johnson County. Two observations of the state threatened grass pickerel have been reported from Louisa County.

Table 2.11-4

PROTECTED AQUATIC SPECIES IOWA RIVER

Species	Federal Status	Iowa Status	Site Occurrences by County
Bullhead Mussel	--	E	Johnson(2)
Grass Pickerel	--	T	Louisa(2)
Slough Sandshell	--	E	Johnson
Strange Floater	--	T	Johnson(4) Louisa
Yellow Sandshell	--	E	Johnson(5)

E = listed as endangered

T = listed as threatened

2.11.4.2 Important Aquatic Habitat

This reach of the Iowa River contains one important tailwater fishery, numerous important backwater areas and the Coralville Reservoir. The tailwater fishery below Coralville Reservoir supports a diversity of important gamefish and important areas for various state-listed mussel species. Riffle areas along the Iowa River provide important habitat for smallmouth bass and other species. Weedy backwater areas near Pine Creek in Muscatine County and near Wapello, Iowa, provide important habitat for the state threatened grass pickerel. A diversion dam below Marengo provides important habitat for many species of gamefish. Lowhead dams near the town of Coralville also provide important habitat for various species.

2.11.5 Wildlife

This reach of the Iowa River provides important habitat for waterfowl, bald eagles, pheasant, white-tailed deer, and wild turkeys. Numerous backwater areas and the Coralville Reservoir provide important habitat for migrating bald eagles and waterfowl. Neotropical passerines are known to use

the Iowa River corridor during migration. Other common species known from the Iowa River corridor include coyote, red fox, raccoon, beaver, muskrat, and striped skunk.

2.11.5.1 Wildlife Species of Special Concern

Five protected wildlife species are known to be within this reach of the Iowa River (Table 2.11-5). The bald eagle and Indiana bat are the only Federally-listed wildlife species in this reach. The bald eagle occurs throughout this reach. The state-threatened ornate box turtle has been observed near Wapello in Louisa County and near the Coralville Reservoir in Johnson County. The state endangered northern harrier has also been observed near Coralville Reservoir. The state-threatened stinkpot turtle has been observed south of Riverside, Iowa in Johnson County.

Table 2.11-5

PROTECTED WILDLIFE SPECIES IOWA RIVER

Species	Federal Status	Iowa Status	Site Occurrences by County
Bald Eagle	E	E	Iowa
Indiana Bat	E	E	Louisa
Northern Harrier	--	E	Johnson
Ornate Box Turtle	--	T	Johnson Louisa
Stinkpot	--	T	Johnson

E = listed as endangered

T = listed as threatened

2.11.5.2 Important Wildlife Habitat

Coralville Reservoir and its tailwaters provide important winter fishing habitat for bald eagles. Numerous backwater areas and areas where tributaries flow into the Iowa River provide important habitat for river otters and various species of herons and egrets. Two rookeries are in this reach of the Iowa River. They are in Tama and Marshall Counties. In 1994, the Tama County rookery contained six great blue heron nests and the Marshall County rookery contained an undetermined number of cattle egret nests (Fleckenstein, 1994). Important habitat for the Indiana bat occurs throughout the Iowa River corridor.

2.11.6 Fish and Wildlife Management Areas

This study reach contains 14 major FWMAs, covering over 27,000 acres of land (Table 2.11-6). Federal wildlife refuges account for one of the 14 FWMAs, six are state-owned, and the ownership of nine is undetermined. The 13,510-acre Hawkeye Wildlife Area is the largest management area within this study reach.

Table 2.11-6

**FISH AND WILDLIFE MANAGEMENT AREAS
IOWA RIVER**

Management Areas	State	County	Type	Acres
Odessa Wildlife Area	IA	Louisa	S	4,000
MTNWR (Horseshoe Bend Division)	IA	Louisa	F	3,300
Indian Slough Wildlife Area	IA	Louisa	S	1,100
Cone Marsh State Wildlife Management Area	IA	Louisa	S	862
Hawkeye Wildlife Area	IA	Johnson	S	13,510
Big Bend Conservation Area	IA	Iowa	ND	315
Iowa River Natural Wildlife Refuge	IA	Tama	ND	100
Salt Creek Wildlife Area	IA	Tama	S	114
Otter Creek Marsh	IA	Tama	S	3,400
Arney Bend Wildlife Area	IA	Marshall	ND	203
Grammer Grove Wildlife Area	IA	Marshall	ND	121
Forest Reserve & Access Area	IA	Marshall	ND	85
C. F. Long Wildlife Woods A	IA	Hardin	ND	20
C. F. Long Wildlife Woods B	IA	Hardin	ND	4
Total Identified Acreage				27,134

Type: Federal (F), State (S), Local (L)

ND = No Data

The MTNWR, near Quincy, Illinois, is a 125,000-acre refuge which follows the Mississippi River for 250 miles through Iowa, Illinois, and Missouri. This reach contains only the Horseshoe Bend Division of the refuge, which covers approximately 3,300 acres. The Horseshoe Bend area is still under construction (Sportsman's Atlas Co., 1994).

Hawkeye Wildlife Area is northwest of Iowa City in Johnson County; it contains two wildlife refuges which contain 1,800 acres. Common wildlife at this site include waterfowl, squirrel, deer, turkey, and pheasant. Game fish caught include channel catfish and bullheads (Sportsman's Atlas Co., 1994).

Odessa Wildlife Area is east of Wapello in Louisa County, Iowa. Within shallow water and floodplain timber, the Odessa area offers controlled waterfowl hunting and fishing. Located within

timber and marsh, the Otter Creek Marsh near Chelsea in Tama County contains waterfowl, pheasant, rabbit, and deer. The waterfowl refuge within the Otter Creek area is closed in the fall. Indian Slough Wildlife Area, located near Wapello, is situated within marsh and upland-timber. It is managed for stream fishing and hunting.

2.11.7 Natural Areas

Eight areas totalling 401 acres were identified along the Iowa River (Table 2.11-7). The areas include: two USCOE geological areas on Coralville Reservoir, prairies, and unique rock formations in the river.

Table 2.11-7

NATURAL AREAS IOWA RIVER

Natural Areas	State	County	Type	Acres
Fallen Rock	IA	Hardin	S	122
Hardin City Woodland	IA	Hardin	S	25
Mann Wilderness Area	IA	Hardin	P	103
Marietta Sand Prairie	IA	Marshall	P	17
Indiana Fish Trap	IA	Iowa	S	1
Old State Quarry	IA	Johnson	F	80
Merrill A. Stainbrook	IA	Johnson	F	33
Williams Prairie	IA	Johnson	P	20
Total Identified Acreage				401

Type: Federal (F), State (S), Private (P) ND = No Data

Fallen Rock south of Steamboat Rock features sandstone bluffs carved along the Iowa River. The north-facing bluffs are cooler and wetter than the surrounding area. The bluffs support a unique ecosystem of white pine, yellow birch, and leatherwood which are usually found further north. The area is also an important wildlife corridor especially for migrating birds species including raptors. Hardin City Woodland is a state-owned area containing north facing slopes with stratified community types from top to bottom. The steep upper bluff dominants are oak and hickory. The slope community is dominated by sugar maple and basswood. The floodplain forest is dominated by soft maple and cottonwood. The Mann Wilderness area is a county-owned archeological site near Steamboat Rock. It features mound groups and campsites dating from 3000 B.C. and A.D. 500. Resident and migrant wildlife use the upland woodland area which is a link in the Iowa River greenbelt. The Marietta Sand Prairie near Marshalltown is a county-owned geologic area. The area

features dry upland prairie, wet prairie, and wet woodland set on upland deposits of windblown sand. Sand reedgrass, sand lovegrass and big and little bluestem occur in the upland prairie. Sedges and sensitive fern are predominate in wet prairie areas. Red elm, box elder, and aspen dominate the wet woodland area. Indian Fish Trap, near Homestead, is an archeological site in the Iowa River. A unique rock formation forms a funnel where fish were driven and hand-captured. The Old State Quarry is a USCOE-owned geologic and historic site on the west side of the Coralville Reservoir. It features Devonian-age limestone quarried during the 1830's. The composition of the deposit is mainly fossil fragments which cemented in a tidal surge channel. Limestone from this formation was used in the Old State Capitol in Des Moines. Merrill A. Stainbrook preserve is a USCOE-owned geological area on the west side of Coralville Reservoir. Named after an Iowa geologist, it features fossils of colonial corals and brachiopods. One area shows bedrock surfaces which were furrowed by glaciers half a million years ago. Furrows indicate the direction of glacial movement. The Williams Prairie near Oxford is owned by the Nature Conservancy. It is a sedge meadow and wet prairie within the Iowa River floodplain. The prairie is within a shallow, poorly drained area and remains wet through the growing season. The area features several rare plants and animals (Fleckenstein, 1992).

2.11.8 Recreation Areas

This study reach contains eight major recreation areas (Table 2.11-8). State parks and recreation areas account for one of the eight recreation areas, with the remaining seven are locally-owned. No Federal recreation areas occur within this study reach. Camping, picnicking, and hunting/fishing were the most commonly available recreational opportunities along this study reach. Hiking/biking and water activities were less common.

Table 2.11-8

RECREATION AREAS IOWA RIVER

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Lake MacBride State Park	IA	Johnson	2,150	S	X	--	X	X	X
Riverview Park	IA	Marshall	128	L	X	X	X	--	--
North Center Park	IA	Marshall	5	L	--	--	X	--	X*
Timmons Grove County Park	IA	Marshall	206	L	X	X	X	X	X*
Lepley Park	IA	Hardin	9	L	X	X	--	--	--
David Bates Memorial Park	IA	Hardin	38	L	X	X	X	X	X*
Long Memorial Park	IA	Hardin	7	L	X	--	X	--	X*
Brekke Memorial Park	IA	Hardin	7	L	X	X	--	--	--
Total Identified Acreage			2,550						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Lake MacBride State Park is located near North Liberty in Johnson County, Iowa. The park offers 40 electric campsites, 82 non-electric campsites, hiking trails, and a 812-acre man-made lake. The lake can be used for swimming and fishing (Sportsman's Atlas Co., 1994).

Timmons Grove County Park, Riverview Park, and North Center Park are located in Marshall County, Iowa. Timmons Grove County Park offers camping, picnicking, hiking, snowmobiling, cross-country skiing, stream fishing, and water sports with an historic site is located at this park. Camping, picnicking, fishing, and cross-country skiing are popular activities at Riverview Park. North Center Park, located near Iowa's Veterans Home, has canoe access and stream fishing available (Sportsman's Atlas Co., 1994).

Lepley Park, David Bates Memorial Park, Long Memorial Park, and Brekke Memorial Park are in Hardin County, Iowa. Lepley Park, north of Union, offers camping and picnicking facilities. David Bates Memorial Park has camping, picnicking, hiking trails, stream fishing, hunting, and canoe access available. Long Memorial Park, site of a pioneer mill, provides camping, stream fishing, canoe access, facilities for handicapped persons. Brekke Memorial Park has facilities for camping and picnicking (Sportsman's Atlas Co., 1994).

2.11.9 Data Gaps

No NWI data were available for wetlands in this reach.

2.11.10 References Cited

Conover, M. 1994. *Commercial Fishing Report of Iowa's Inland Lakes*. 1993. Iowa Department of Natural Resource. Des Moines, IA.

Fleckenstein, J. 1992. *Iowa State Preserves Guide*. Iowa Department of Natural Resources, Des Moines, IA.

Fleckenstein, J. 1994. *Correspondence*. Iowa Department of Natural Resources. Des Moines, Iowa.

Konrad, M. 1994. *Personal Communication*. Iowa Department of Natural Resources. Des Moines, Iowa.

National Park Service. 1994. *Draft Mississippi River Corridor Study, Vol 2: Inventory of Resources and Significance*.

Sportsman's Atlas Co. 1994. *Iowa Sportsman's Atlas*. Lytton, IA.

2.12 DES MOINES RIVER

This study reach consists of the Des Moines River. It is approximately 220 river miles in length (See Figure 2-12). The reach starts at the Saylorville Reservoir and ends where the Des Moines River enters the Mississippi River. The reach adjoins thirteen counties in Iowa and one in Missouri. Major communities located along this reach are Des Moines and Ottumwa, Iowa. The Raccoon River is the primary tributary entering the Des Moines River.

2.12.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.12.1. Descriptions of the state soil associations are provided in Appendix A.

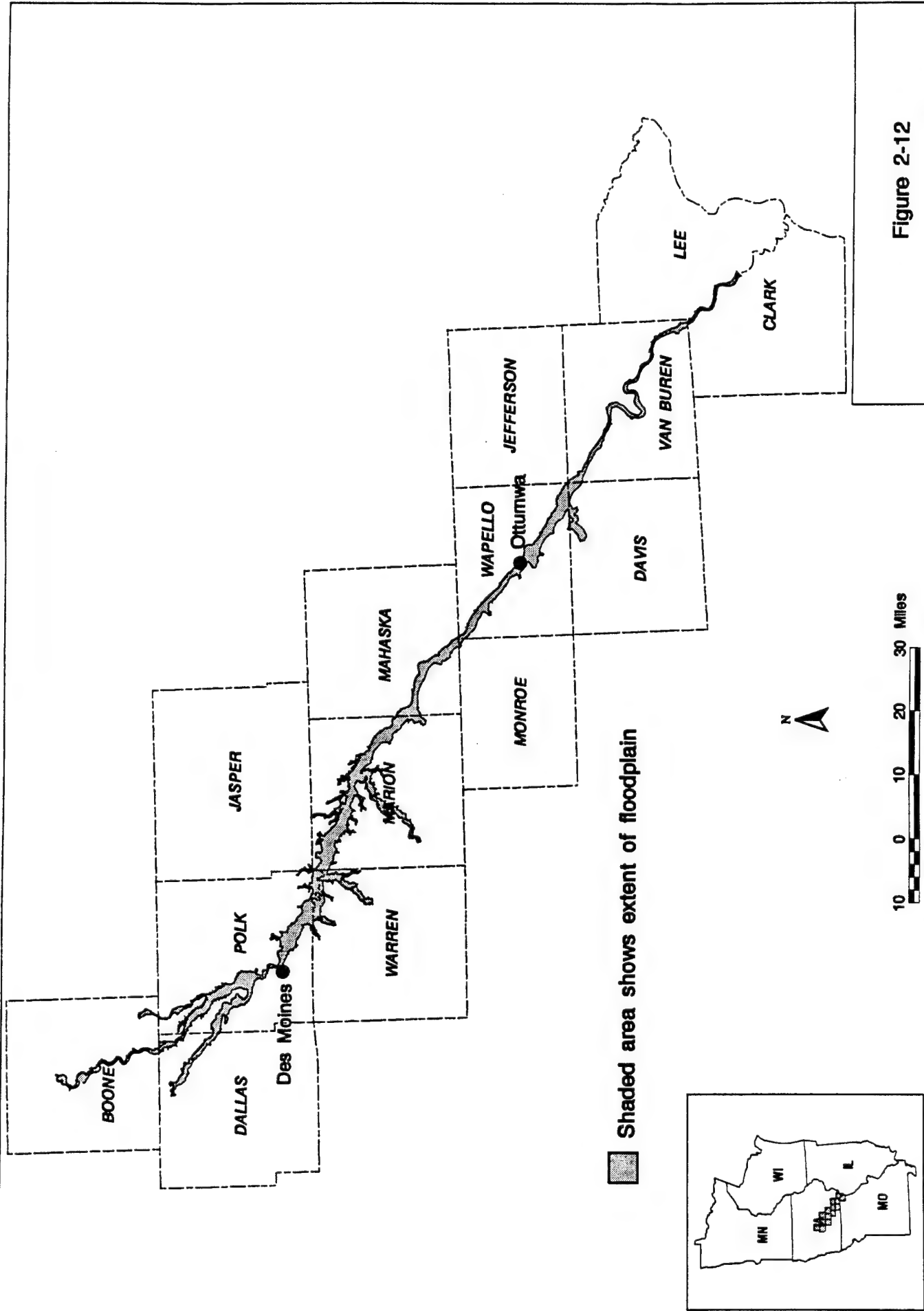


Table 2.12-1

**SOIL ASSOCIATIONS
DES MOINES RIVER**

Soil Association	State	Occurrences	Acres	Percent
COLAND-WADENA-HAVELOCK	IA	41	33,160	20
HAYDEN-LESTER-STORDEN	IA	66	3,250	2
CANISTEO-NICOLLET-CLARION	IA	18	2,960	2
CLARION-NICOLLET-WEBSTER	IA	10	1,140	<1
LADOGA-GARA-ARMSTRONG	IA	62	5,600	3
DOWNS-TAMA-FAYETTE	IA	33	2,150	1
COLO-NODAWAY-ZOOK	IA	8	62,790	39
LADOGA-GIVIN-HEDRICK	IA	50	3,740	2
SHARPSBURG-SHELBY-COLO	IA	2	50	<1
TAMA-KILLDUFF-COLO	IA	3	80	<1
CLINTON-LINDLEY-KESWICK	IA	11	1,230	<1
GOSPORT-PERSHING-ARMSTRONG	IA	2	30	<1
NODAWAY-LAWSON-COLO	IA	4	41,150	25
OTLEY-ADAIR-LADOGA	IA	2	800	<1
LINDLEY-WELLER-KESWICK	IA	44	4,250	3
GARA-ARMSTRONG-PERSHING	IA	1	10	<1
LINDLEY-KESWICK-GOSS	IA	7	450	<1
LINDLEY-KESWICK-GOSS	MO	7	200	<1
SOIL ASSOCIATIONS SUB TOTAL	--	371	163,040	100
UNCLASSIFIED AQUATIC	ALL		18,360	--
SOILS AND AQUATIC TOTAL	--	--	181,400	--

2.12.2 Land Use/Land Cover

2.12.2.1 Land Use

The total area of floodplain for this reach covers 181,400 acres (Table 2.12-2). Saylorville Reservoir is at the northern end of the reach. Red Rock Dam creates the Red Rock Reservoir southeast of Des Moines. The river follows a relatively straight course from the Red Rock Dam to Ottumwa, Iowa. Below Ottumwa the river and the floodplain widen until they reach the Mississippi River.

Table 2.12-2

**LAND USE/LAND COVER
DES MOINES RIVER**

Cover Type	Acres	Percent
Urban	10,160	6
Agriculture	101,890	56
Forest	2,770	1
Wetland*	21,770	12
Water	44,720	25
Barren	90	< 1
Total	181,400	100

*No NWI data available for forested wetland.

The Des Moines River flows through two urban areas, Des Moines and Ottumwa. Railroad tracks follow the left descending bank from Wapella County to the confluence with the Mississippi River. Agriculture is the largest land use in this reach. Large areas of agriculture are found below Red Rock Dam and in the horseshoe bend of the river near Keosauqua.

2.12.2.2 Vegetation

The southern half of the Des Moines River is in the Central Irregular Plains ecological region. This region is a mosaic of bluestem prairie and oak-hickory forests. The northern half of the reach is in the Western Corn Belt Plains which is characterized by bluestem prairie (NPS, 1994). Scattered patches of forest are found in the floodplain between the Mississippi River and Des Moines. The area around the Saylorville Reservoir is the most heavily wooded. The floodplain forest consists of elm, ash, and cottonwood. Oak-hickory forests are found in upland areas. Occasionally, native red cedars are found in the oak-hickory forests (SCS, 1983).

2.12.2.3 Plant Species of Special Concern

No plant species of special concern are in this area.

2.12.3 Aquatic Resources

2.12.3.1 Wetlands

No NWI data was available for this study reach. However, wetlands were identified by reviewing USGS topographic maps. Based on the land use/land cover data, approximately 21,720 acres of vegetated wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Very few islands are present within the channel of the Des Moines River. Therefore, most of the wetlands are located directly adjacent to the main river channel or

along some of the larger tributaries, lakes, or ponds. For the most part, wetlands exist as small isolated ecosystems. This is primarily due to the large amount of agricultural land located within the Des Moines River floodplain.

The largest wetlands are above the two lakes on the Des Moines River: Lake Red Rock and Saylorville Lake. On the upper end of Lake Red Rock, between Runnells and Des Moines, large amount of wetlands are along the river. Several large wetlands are above Saylorville Lake. Some of these wetlands are within Ledges State Park. Several wetland areas are in the river bends between Chillicothe and Eddyville.

2.12.3.2 Lakes and Ponds

Approximately 139 individual lakes and ponds are located within the river segment. As mentioned, the two largest lakes are Lake Red Rock and Saylorville Lake. The total surface area of these lakes and ponds is approximately 15,140 acres. These water bodies are larger than those in most of the other reaches. The average size of each pond or lake is approximately 109 acres.

North of Eddyville, is a large oxbow lake surrounded by forested wetlands. Two ponds are also in this area. Several large ponds or lakes are located within and around the city of Ottumwa.

2.12.3.3 Tributaries

Several tributaries empty into the Des Moines River. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
English Creek	Harvey, IA
Beaver Creek	Des Moines, IA
Big Creek	N. of Des Moines, IA
White Breast Creek	Lake Red Rock
South River	S. of Des Moines, IA
Middle River	S. of Des Moines, IA

A significant wetland complex with associated ponds is near Harvey, at the confluence of the Des Moines River and English Creek. This area is just below the dam for Lake Red Rock.

2.12.4 Fisheries

The Des Moines River is one of the most important environmental corridors in Iowa. Fish populations, however, have been adversely affected by poor water quality in most of the Des Moines River (SCS, 1983). Some areas where panfish, walleye and bass once flourished are now occupied by buffalo. The channel catfish is probably the most common and important gamefish in the Des Moines River. Konrad (1994) reported that channel catfish is the only major species in the Des Moines; minor species included flathead catfish, walleye, northern pike, crappie, smallmouth bass,

white bass, and wiper (white bass x striped bass). The Red Rock Reservoir formed by the Des Moines River in Marion County is Iowa's largest lake. The lake covers 19,000 acres with a total land area of 50,000 acres. Major species in Red Rock Reservoir include channel catfish and white bass. Minor species include crappie, walleye, and largemouth bass. Major species caught commercially include carp, carpsucker, and buffalo (Konrad, 1994). Paddlefish, shovelnose sturgeon, and white bass are common above the hydroelectric dam near Ottumwa. No mussel harvesting is allowed.

2.12.4.1 Aquatic Species of Special Concern

According to the Iowa Natural Heritage Inventory (NHI), no protected aquatic species occur in this reach. However, the western sand darter has been observed outside of this reach near the city of Des Moines.

2.12.4.2 Important Aquatic Habitat

The Des Moines River contains three important tailwater fisheries below Saylorville Lake, Red Rock Reservoir, and Bonaparte Dam. The dams act as natural barriers and tend to concentrate fish. The Roberts Creek Area in Red Rock Reservoir provides important spawning habitat for many species of fish. Backwaters from the Ottumwa hydroelectric dam provides important habitat for paddlefish, white bass, and shovelnose sturgeon. The washed-out Bonaparte Dam in Van Buren County provides an important riffle area.

2.12.5 Wildlife

The Des Moines River basin provides an important east-west corridor for many wildlife species in southern Iowa. Pheasant, gray partridge, wild turkey, white-tailed deer, and rabbits all utilize the Des Moines River corridor. Saylorville and Red Rock reservoirs provide important habitat for migrating waterfowl.

2.12.5.1 Wildlife Species of Special Concern

The Des Moines River basin provides important habitat for the Federally-endangered Indiana bat. The Indiana bat migrates from wintering areas in Missouri to raise their young in riparian corridors in Iowa (SCS, 1983). Bald eagles spend some time in the winter along the Des Moines River, primarily below the Red Rock dam. The natural heritage database lists two accounts of the bald eagle, both from Mahaska County. Bald eagles have also been observed near the mouth of the Des Moines River near Keokuk. The Iowa NHI lists three accounts of the Indiana bat along the Des Moines River (Table 2.12-5). Two of the Indiana bat accounts are from Marion County south of Pella, Iowa and one account is from Van Buren County near Keosauqua. The copperhead snake is listed as state endangered and is reported from Van Buren County south of Keosauqua.

2.12.5.2 Important Wildlife Habitat

Because of the scarcity of large blocks of timber in this area, the Des Moines River corridor provides important habitat for many species of wildlife. In particular, Red Rock Reservoir provides a diversity of important habitats. Information obtained from Fleckenstein (1994) indicated two important rookery areas in Marion County. One rookery located east of the city of Swan, Iowa, had seven nests in 1994. The other rookery, in the Red Rock Reservoir, contained eight great blue heron nests, four great egret nests, and two black crowned night heron nests in 1994.

Important habitat for bald eagles occurs below the Saylorville and Red Rock dams. These areas concentrate fish and provide important forage for bald eagles in winter. The mouth of the Des Moines River also provides important habitat for bald eagles in winter.

Table 2.12-5

**PROTECTED WILDLIFE SPECIES
DES MOINES RIVER**

Species	Federal Status	Iowa Status	Site Occurrences by County
Bald Eagle	E	E	Mahaska(2)
Copperhead Snake	--	E	Van Buren
Indiana Bat	E	E	Marion(2) Van Buren

E = listed as endangered

T = listed as threatened

2.12.6 Fish and Wildlife Management Areas

This study reach contains 11 major FWMAs. Seven of these areas are state-owned; the ownership of the remaining four is undetermined. No Federal wildlife refuges are within this study reach. The management areas contain over 42,700 acres of land and water; the largest is the Red Rock Wildlife Area. The 11 management areas are listed by state in Table 2.12-6; the acreage of each is also provided.

The Red Rock Wildlife Area, located north of Pleasantville, is composed of timber and wetlands and is home to various wildlife, including pheasant, quail, deer, rabbit, waterfowl, and turkey. Opportunities for hunting are available.

Located west of Polk City, the Saylorville Wildlife Area provides habitat for waterfowl, turkey, deer, pheasant, and squirrel. The Big Creek Wildlife Area is situated northwest of Polk City in Polk County, Iowa. Within the management area is Big Creek Lake and various wildlife, such as deer, quail, and rabbit.

Table 2.12-6

**FISH AND WILDLIFE MANAGEMENT AREAS
DES MOINES RIVER**

Management Areas	State	County	Type	Acres
Schulz Conservation Area	IA	Van Buren	ND	2
Eldon Wildlife Area	IA	Davis	S	925
Fox Hills Wildlife Area	IA	Wapello	S	1,297
Gray Eagle Wildlife Reserve	IA	Wapello	ND	142
McNeese Wildlife Area	IA	Wapello	ND	14
Quercus Wilderness Area	IA	Mahaska	ND	78
Red Rock Wildlife Area	IA	Marion, Warren, Polk	S	25,542
Saylorville Wildlife Area	IA	Polk, Dallas, Boone	S	10,904
Big Creek Wildlife Area	IA	Polk	S	3,100
McCoy Wildlife Area	IA	Boone	S	435
Holst Forest Area	IA	Boone	S	313
Total Identified Acreage				42,752

Type: Federal (F), State (S), Local (L) ND = No Data

2.12.7 Natural Areas

The Des Moines River Ravines Natural Area is the only designated natural area in this reach. The area is located in Clark County, Missouri, within the Battle of Athens State Park. The area features steep slopes with coves and ravines overlooking the Des Moines River. The north facing slopes have unusual flora including ferns, snow trillum, white banesberry, and spikenard. Upper ravines and ridgetops support mixed hardwoods. The Missouri DNR owns the 40-acre area, which is east of Anson (Thom and Iffing, 1985; Anderson, 1983).

Table 2.12-7

**NATURAL AREAS
DES MOINES RIVER**

Natural Areas	State	County	Type	Acres
Des Moines River Ravines Natural Area	MO	Clark	S	40

Type: Federal (F), State (S), Private (P)

2.12.8 Recreation Areas

This study reach contains 18 major recreation areas (Table 2.12-8). State parks and forests account for seven of the 18 recreation areas; the remaining 10 being locally-owned (Sportsman's Atlas Co., 1994). No Federal recreation areas occur within this study reach. Camping, picnicking, hunting/fishing, and hiking/biking were the most commonly available recreational opportunities along this study reach. Water activities were less common, and limited boat accesses were available. The 18 recreation areas and the activities which they provide are listed in Table 2.12-8.

Table 2.12-8

**RECREATION AREAS
DES MOINES RIVER**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Shimek State Forest	IA	Lee, Van Buren	7,869	S	X	—	X	X	—
Croton Civil War Memorial Park	IA	Lee	8	L	X	X	X	—	X
Bentonsport River Side Park	IA	Van Buren	10	L	X	X	X	X	X*
Lacey-Keosauqua State Park	IA	Van Buren	1,653	S	X	X	X	X	X
Austin Park	IA	Van Buren	6	L	X	X	X	—	—
Rock Bluff Park	IA	Marion	32	L	X	X	X	X	—
Cordova Park	IA	Marion	1,034	L	—	X	—	X	—
Elk Rock (Red Rock) State Park	IA	Marion	2,218	S	X	—	X	X	X*
Roberts Creek Park	IA	Marion	1,535	L	X	X	X	X	X*
Yellow Banks Park	IA	Polk	474	L	X	X	X	X	—
Big Creek State Park	IA	Polk	1,536	S	—	—	X	X	X*
Lewis A. Jester Park	IA	Polk	2,557	L	X	X	X	X	X
Margo Frankel Woods State Park	IA	Polk	136	S	—	—	—	X	—
Swede Point Park	IA	Boone	120	L	X	X	X	X	—
Holst State Forest	IA	Boone	313	S	—	—	X	—	—
Ledges State Park	IA	Boone	1,200	S	X	X	X	X	—
Battle of Athens State Park	MO	Clark	42	S	X	X	X	—	X
Total Identified Acreage			20,743						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Battle of Athens State Park, "site of the northern most [Civil War] battle fought west of the Mississippi River", is near the town of Wayland. Recreational opportunities include picnicking, camping, fishing, and boating (Byrd and Byrd, 1993).

The Shimek State Forest, south of Hillsboro, is comprised of the Croton (1,707 acres), Donnellson (923 acres), Lick Creek (2,355 acres), Farmington (1,217 acres), and Keosauqua (898 acres) units. Wildlife that inhabit the area include quail, rabbit, squirrel, deer, and turkey. Hunting, fishing, camping, and hiking activities are available (Sportsman's Atlas Co., 1994).

Lacey-Keosauqua State Park provides opportunities for camping, hiking, swimming, lake and stream fishing, and snowmobiling. Within the park is a 22-acre man-made lake, a ramp, and boat rental facilities (Sportsman's Atlas Co., 1994).

Elk Rock (Red Rock) State Park is north of Knoxville, near Red Rock Lake. Facilities at the park include a nature trail, electric and non-electric campsites, bridle and hiking trails, and a boat ramp. Opportunities for lake fishing and snowmobiling are provided. (Sportsman's Atlas Co., 1994).

The Big Creek State Park in Polk County, Iowa, is northwest of Polk City. Recreational opportunities include bicycling and hiking trails, swimming, lake fishing, and snowmobiling. A ramp and boat rental facilitate water activities on the 905-acre man-made lake which is within the park (Sportsman's Atlas Co., 1994).

West of Luther in Boone County, Iowa, Ledges State Park provides 82 camping sites, picnic areas, biking trails, stream fishing, snowmobiling, and a scenic overlook (Sportsman's Atlas Co., 1994).

2.12.9 Data Gaps

No NWI data was available for this reach.

2.12.10 References Cited

Anderson, J. 1983. *Addition to the Eight-County Natural Features Inventory; Scotland, Clark, Knox, Lewis, Shelby, and Marion Counties*. Missouri Department of Conservation. Jefferson City, MO.

Byrd, B. and Byrd, R. 1993. *Missouri Outdoor Atlas*. Warsaw, MO.

Fleckenstein, J. 1994. *Correspondence*. Iowa Department of Natural Resources. Des Moines, IA.

Konrad, M. 1994. *Personal Communication*. Iowa Department of Natural Resources. Des Moines, IA

Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.

Soil Conservation Service and Forest Service. 1983. *Environmental Corridors: Des Moines River Basin Study*. Des Moines, IA.

Sportsman's Atlas Co. 1994. *Iowa Sportsman's Atlas*. Lytton, IA.

USCOE. Sept. 1983. *Upper Mississippi River Land Use Allocation Plan; Master Plan for Public Use Development and Resource Management Part I and Part II*. St. Paul, MN.

2.13 NORTH FORK OF THE RACCOON RIVER

This study reach includes part of the North Raccoon River and is approximately 90 river miles in length (see Figure 2-13). It begins in Greene County, runs through Dallas and Polk Counties, and ends where the Raccoon River enters the Des Moines River. The major community located along this reach is Des Moines, Iowa. The South Raccoon River is the primary tributary entering the North Raccoon River along this reach.

2.13.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.13-1. Descriptions of the state soil associations are provided in Appendix B.

Table 2.13-1

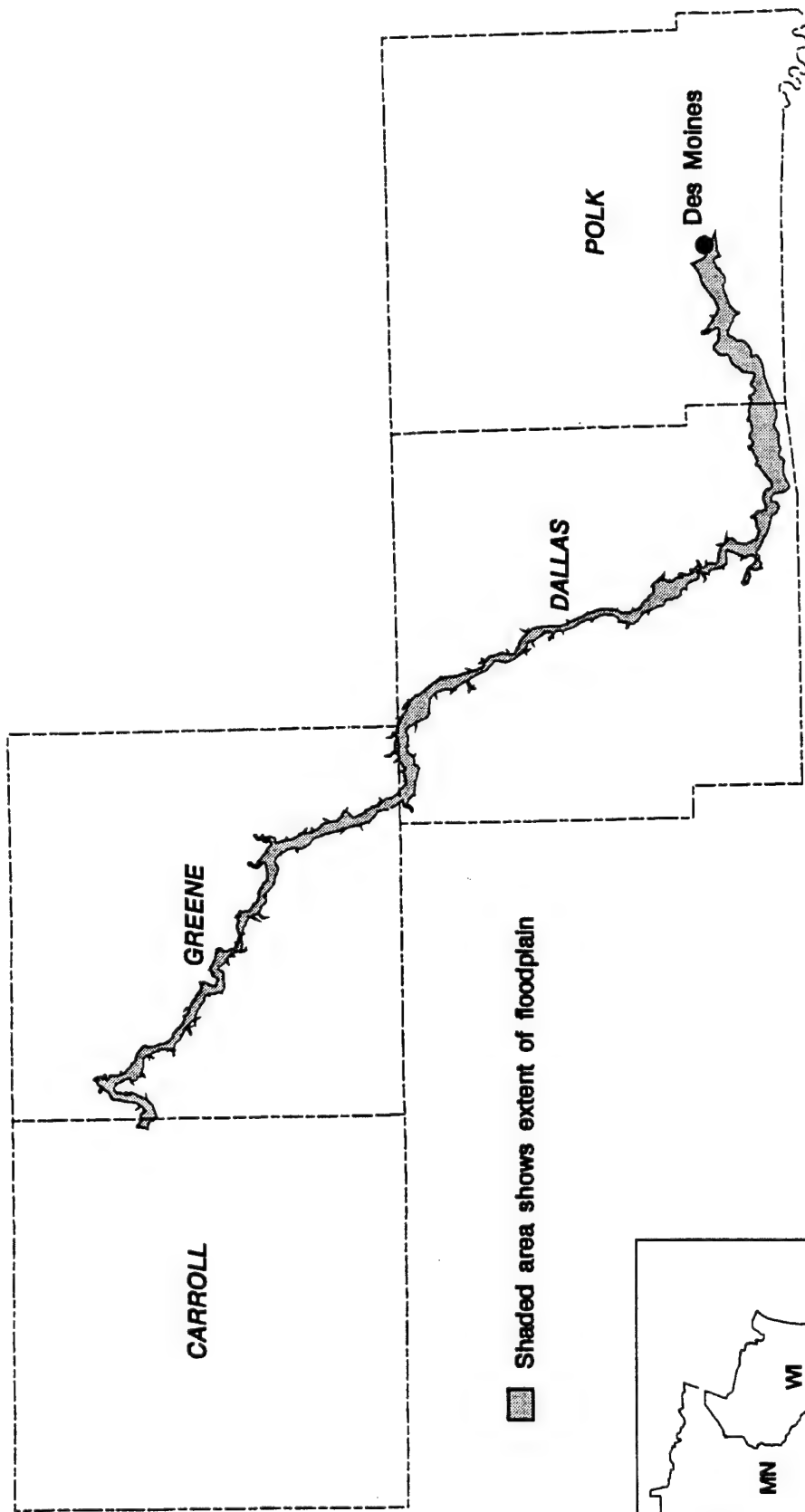
SOIL ASSOCIATIONS NORTH FORK OF THE RACCOON RIVER

Soil Association	State	Occurrences	Acres	Percent
COLAND-STORDEN-HAYDEN	IA	2	17,200	43
CLARION-NICOLLET-WEBSTER	IA	14	280	<1
CANISTEO-NICOLLET-CLARION	IA	12	50	<1
HAYDEN-LESTER-STORDEN	IA	12	2,970	7
COLAND-WADENA-HAVELOCK	IA	2	4,500	11
CLARION-STORDEN-NICOLLET	IA	7	120	<1
COLO-NODAWAY-ZOOK	IA	1	13,600	34
LADOGA-GARA-ARMSTRONG	IA	14	930	2
SOIL ASSOCIATIONS SUB TOTAL	--	64	39,650	100
UNCLASSIFIED AQUATIC	IA	--	0	--
SOILS AND AQUATIC TOTAL	--	--	39,650	--

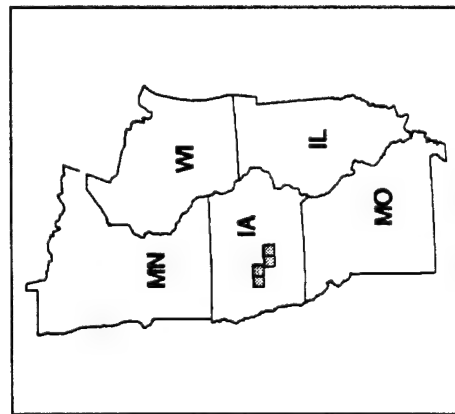
2.13.2 Land Use/Land Cover

2.13.2.1 Land Use

The total area of floodplain within this reach encompasses 39,650 acres (Table 2.13-2). The floodplain is narrow, less than one mile wide west of Des Moines. The southern end of the reach is urban, where the river flows through metropolitan Des Moines.



■ Shaded area shows extent of floodplain



Key Map



Figure 2-13
North Fork of the
Raccoon River

Table 2.13-2

**LAND USE/LAND COVER
NORTH FORK OF RACCOON RIVER**

Cover Type	Acres	Percent
Urban	3,860	10
Agriculture	24,210	61
Range	0	--
Forest	3,650	9
Wetland*	3,980	10
Water	3,730	9
Barren	220	< 1
Total	39,650	100

*No NWI data available for forested wetland.

2.13.2.2 Vegetation

This section of the North Raccoon River is in the Western Corn Belt Plains ecological region (NPS, 1994). The dominant grass species that comprise this prairie type are big bluestem, Indian grass, and prairie dropseed (Fleckenstein, 1992). The majority of this land is used for agriculture. A thin band of forest is found on either side of the river fairly consistently along the entire reach. The floodplain forests are composed of cottonwood, silver maple, and green ash (SCS, 1983).

2.13.2.3 Plant Species of Special Concern

No plant species of special concern occur along this reach.

2.13.3 Aquatic Resources

2.13.3.1 Wetlands

No NWI data was available for this study reach. However, wetlands were identified by reviewing USGS topographic maps. Based on land use/land cover data, approximately 3,980 acres of vegetated wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Few islands are present within the channel of the Raccoon River. Most of the wetlands are directly adjacent to the main river channel or along some of the larger tributaries, lakes, or ponds. For the most part, wetlands exist as small isolated ecosystems. This is primarily due to the large amount of agricultural land located within the floodplain of this fork of the Raccoon River. Southwest of Des Moines, a series of several lakes have associated wetland areas.

2.13.3.2 Lakes and Ponds

Approximately 57 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 780 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is approximately 14 acres.

Several large ponds or lakes are southwest of Des Moines near Walnut Woods State Park. Another large pool occurs between the towns of Adel and Perry.

2.13.3.3 Tributaries

Several tributaries empty into the Raccoon River within this particular segment. Many of these tributaries are small perennial to intermittent streams. Following is a list of the largest tributaries and their locations:

Tributary	Confluence Location
South Fork of the Raccoon River	W. of Des Moines, IA
Buttrick Creek	E. of Jefferson, IA
Cedar Creek	N. of Scranton, IA

2.13.4 Fisheries

The North Fork of the Raccoon River consists of shallow braided chutes comprised of sandbars, snags, pools, and occasional riffles. Major species of this reach include the channel catfish and flathead catfish (Conover, 1994). Minor species include walleye, smallmouth bass, northern pike, and white bass. The channel catfish is the most commonly caught gamefish. Channel catfish inhabit the deeper pools, log jams, and cutbanks. Flathead catfish are also common in this reach. Due to an aggressive stocking program by the Iowa DNR, walleye are available in the portion of the Raccoon River in Carroll and Greene Counties. Other common fish species in this reach of the Raccoon River include carp and suckers.

2.13.4.1 Aquatic Species of Special Concern

Three species of fish with protected status occur in this reach of the Raccoon River (Table 2.13-4). None of these species have Federal protection under the Endangered Species Act. Dallas County had the highest number of observations of protected fish along this reach. The blacknose shiner, chestnut lamprey, and western sand darter have all been observed in Dallas County near Adair. The western sand darter has also been observed near Parry in Dallas County, near Jefferson in Greene County and in Polk County near Des Moines. All three species are listed as threatened in Iowa.

Table 2.13-4

**PROTECTED AQUATIC SPECIES
NORTH FORK OF RACCOON RIVER**

Species	Federal Status	Iowa Status	Site Occurrences by County
Western Sand Darter	--	T	Dallas (2) Polk Greene
Blacknose Shiner	--	T	Dallas
Chestnut Lamprey	--	T	Dallas

E = listed as endangered

T = listed as threatened

2.13.4.2 Important Aquatic Habitat

The Iowa DNR has created numerous riffle areas along this reach. These riffle areas and the deeper pools above them provide important habitat for many aquatic species. Buttrick Creek in Greene County provides important spawning habitat for smallmouth bass and walleye in the spring. An old hydroelectric dam that is now out of service near Adel, Iowa provides important deepwater areas for fish migrating upstream from the Des Moines River. Areas along the Raccoon River with sandy substrates, moderate flow, and clear water provide important habitat for the western sand darter. Clear permanent flowing tributaries provide important spawning habitat for the chestnut lamprey and blacknose shiner.

2.13.5 Wildlife

Common wildlife species found in this reach include white-tailed deer, wild turkey, pheasant, bobwhite quail, various species of songbirds, coyote, red fox, raccoon, beaver, and striped skunk. Backwater areas and slow moving pools provide important habitat for many species of waterfowl. Common waterfowl species include Canada goose, mallard, wood duck, great blue heron, and green heron.

2.13.5.1 Wildlife Species of Special Concern

According to the Iowa Natural Heritage data, no protected wildlife species occur in this reach of the Raccoon River. However, bald eagles undoubtedly use the Raccoon River during migration.

2.13.5.2 Important Wildlife Habitat

No areas along this reach have been identified by state or Federal agencies as having important habitat for wildlife.

2.13.6 Fish and Wildlife Management Areas

This study reach contains five major FWMAs, with undetermined ownership. No Federal wildlife refuges are within this study reach. The majority of these FWMAs are in Greene County, Iowa. The five management areas are listed by state in Table 2.13-6.

Table 2.13-6

FISH AND WILDLIFE MANAGEMENT AREAS NORTH FORK OF THE RACCOON RIVER

Management Areas	State	County	Type	Acres
Browns Woods	IA	Polk	ND	484
Crellin Wildlife Refuge	IA	Dallas	ND	16
Squirrel Hollow Wildlife Area	IA	Greene	ND	147
Hobart Wildlife Area	IA	Greene	ND	66
Horseshoe Bend Wildlife Area - West Unit	IA	Greene	ND	20
Total Identified Acreage				733

Type: Federal (F), State (S), Local (L)

ND = No Data

The Browns Woods area, the largest FWMA in this study reach with 484 acres, is located east of West Des Moines off Highway 28 in Polk County, Iowa. Hiking and cross-country trails dominate the area.

Squirrel Hollow Wildlife Area, Hobart Wildlife Area, and Horseshoe Bend Wildlife Area are within Greene County, Iowa. The Squirrel Hollow area is southeast of Jefferson. Activities at this site include hiking, fishing, canoeing, and hunting. An historic site is within the wildlife areas. The Hobart area, northeast of Ralston, provides opportunities for fishing and hunting. Horseshoe Bend Wildlife Area, located north of Ralston, provides fishing, canoeing, hunting, and hiking activities. The 16-acre Crellin Wildlife Refuge, southwest of Minburn, is a small refuge offering primarily fishing opportunities.

2.13.7 Natural Areas

Silver-Smith Woods is the only designated natural area in this study reach. The North Raccoon River runs through the 20-acre area near Adel in Dallas County, Iowa. The area is owned by the Nature Conservancy and contains glaciated slopes as well as forested lowlands; the lowlands are seasonally flooded by the North Raccoon. Upland areas are white and red oak forests. Eroded slopes on the southern end of the preserve feature exposed Pennsylvanian age sandstone and shale bedrock (Fleckenstein, 1992).

Table 2.13-7

**NATURAL AREAS
NORTH FORK OF THE RACCOON RIVER**

Natural Areas	State	County	Type	Acres
Silver-Smith Woods	IA	Dallas	P	20

Type: Federal (F), State (S), Private (P)

2.13.8 Recreation Areas

This study reach contains 10 major recreation areas. State parks account for one of the 10 recreation areas, with the remaining 9 are locally-owned (Sportsman's Atlas Co., 1994). No Federal recreation areas occur within this study reach. Camping, picnicking, hunting/fishing, and water activities were the most commonly available recreational opportunities along this study reach. Hiking/biking activities were less common. Most of the recreation areas are in Greene County, Iowa. The 10 recreation areas and the activities which they provide are presented in Table 2.13-8.

Table 2.13-8

**RECREATION AREAS
NORTH FORK OF THE RACCOON RIVER**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Walnut Woods State Park	IA	Polk	300	S	X	--	X	X	--
Trindle Park	IA	Dallas	22	L	--	X	--	--	--
Two Rivers Area	IA	Dallas	45	L	X	--	X	--	X*
Sportsman Park	IA	Dallas	40	L	X	X	--	--	--
Squirrel Hollow Park	IA	Greene	56	L	X	X	X	X	X*
Henderson Park	IA	Greene	39	L	X	X	X	X	X*
Seven Hill Park	IA	Greene	80	L	--	X	--	X	--
Oak Hill Park	IA	Greene	5	L	X	X	--	--	--
McMahon Access	IA	Greene	261	L	--	--	X	--	X*
Hyde Park	IA	Greene	57	L	X	X	X	--	X
Total Identified Acreage			905						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Walnut Woods State Park, west of Browns Woods and east of West Des Moines offers camping, fishing, and hiking and bridle trails. This park is the largest recreation area within this study reach.

Trindle Park, Two Rivers Area, and Sportsmans Park are within Dallas County, Iowa. Trindle Park, next to the town of Van Meter, contains only picnicking facilities. The Two Rivers Area offers fishing, camping, and boat access; it is northwest of Van Meter. Sportsmans Park, near Dawson, provides facilities for camping and picnicking.

Squirrel Hollow Park, Henderson Park, Seven Hill Park, Oak Hill Park, McMahon Access, and Hyde Park are in Greene County. Squirrel Hollow Park, southeast of Jefferson, is a county park with camping, picnicking, hiking, fishing, boat access, and baseball facilities. Henderson Park, due south of Jefferson, provides camping, picnicking, fishing and hiking facilities, along with a boat ramp. Seven Hill Park provides opportunities for picnicking, hiking, winter sports; an historic site is at the park. Oak Hill Park is a small, five-acre park, east of the town of Scranton; camping and picnicking facilities are available. The McMahon Access, location of an historic site, is east of Scranton. The access provides a boat ramp and shooting range, along with fishing and hunting opportunities. Hyde Park, northeast of Ralston, provides opportunities for camping, picnicking, boating, and winter sport activities.

2.13.9 Data Gaps

NWI data were unavailable for this reach. Total wetland acreage was taken from the land use/land cover data. USGS maps were used to describe aquatic resources.

2.13.10 References Cited

Anderson, J. 1983. *Addition to the Eight-County Natural Features Inventory; Scotland, Clark, Knox, Lewis, Shelby, and Marion Counties*. Missouri Department of Conservation. Jefferson City, MO.

Byrd, B. and Byrd, R. 1993. *Missouri Outdoor Atlas*. Warsaw, MO.

Conover, M. 1994. *Commercial Fishing Report of Iowa's Inland Lakes*. 1993. Iowa Department of Natural Resource. Des Moines, IA.

Fleckenstein, J. 1992. *Iowa State Preserves Guide*. Iowa Department of Natural Resources, Des Moines, IA.

Fleckenstein, J. 1995. *Telephone Conversation*. Iowa Department of Natural Resources, Des Moines, Iowa.

National Park Service. 1994. *Draft Mississippi River Corridor Study, Vol 2: Inventory of Resources and Significance*.

Soil Conservation Service and Forest Service. 1983. *Des Moines River Basin Study Environmental Corridors*. Des Moines, Iowa.

Sportsman's Atlas Co. 1994. *Iowa Sportsman's Atlas*. Lytton, IA.

Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.

2.14 MISSISSIPPI RIVER: HANNIBAL, MISSOURI TO LOCK AND DAM 26R

This study reach is approximately 98 river miles in length (See Figure 2-14). The reach begins at Lock and Dam 22 (RM 301) and ends at Lock and Dam 26 (RM 203). This reach adjoins two states; five counties in Missouri and four counties in Illinois. Major cities along this reach include Alton, St. Charles and northeast St. Louis, Missouri. The Salt and Illinois Rivers are the primary tributaries entering the river along this reach.

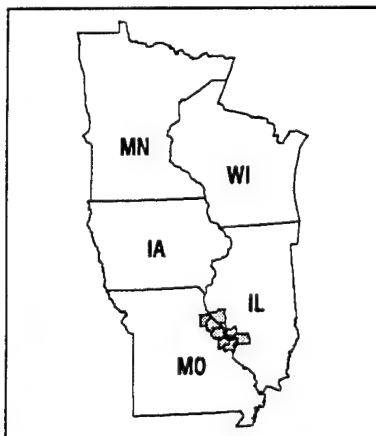
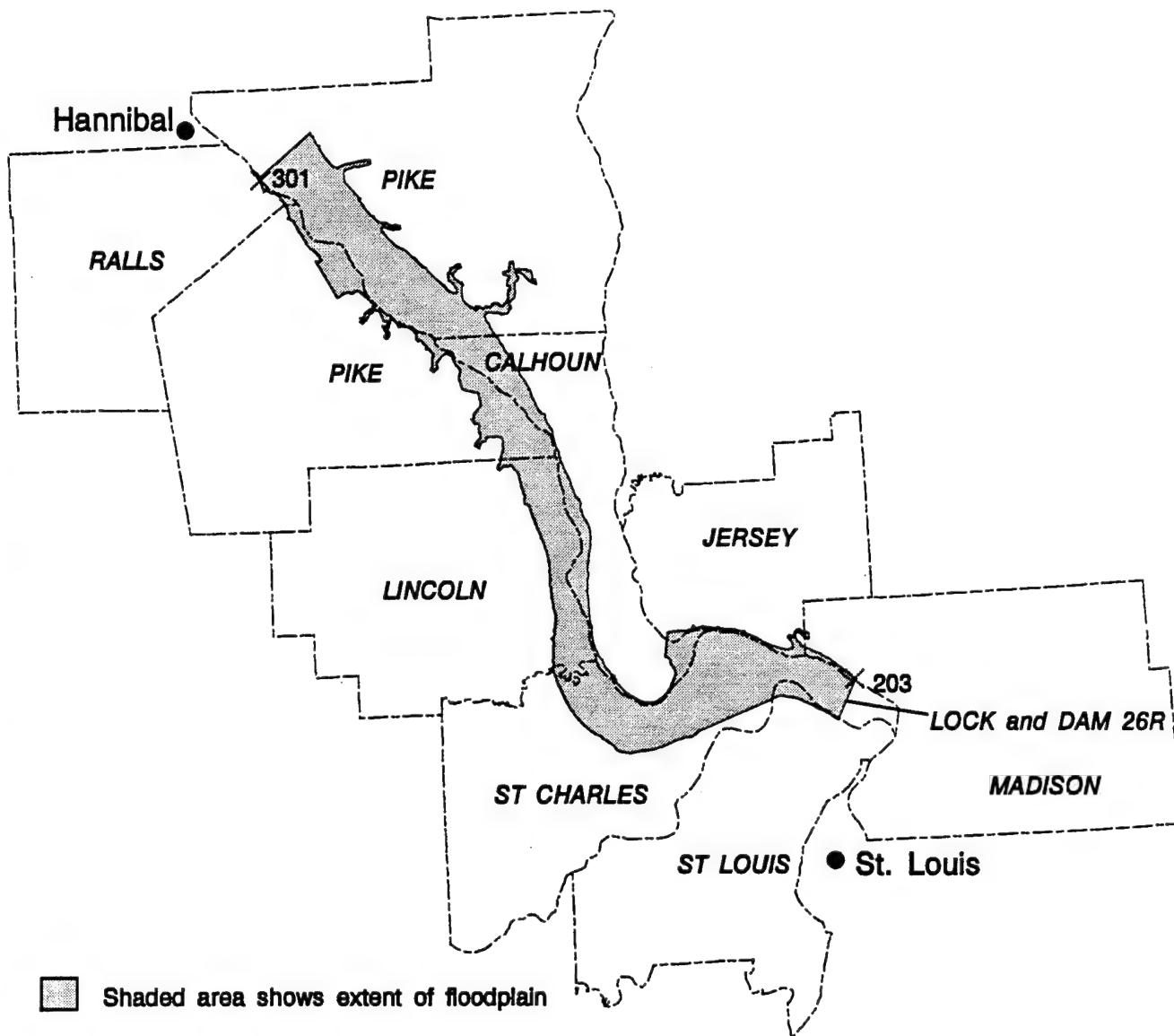
2.14.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.14-1. Descriptions of the state soil associations are provided in Appendix A.

Table 2.14-1

SOIL ASSOCIATIONS MISSISSIPPI RIVER: HANNIBAL - LOCK AND DAM 26R

Soil Association	State	Occurrences	Acres	Percent
WAKELAND-BIRDS-BELKNAP	IL	5	15,020	5
SEATON-HICKORY-MT. CARROLL	IL	25	4,350	2
BEAUCOUP-LAWSON-DARWIN	IL	8	89,500	32
MENFRO-WINFIELD-WELLER	MO	32	5,600	2
CARLOW-PORTAGE-CHEQUEST	MO	19	118,230	42
ROZETTA-FAYETTE-HICKORY	IL	11	4,160	2
HAYMOND-DOCKERY-MONITEAU	MO	2	6,110	2
LOMAX-BLASE-BOOKER	MO	2	9,470	3
HAYNIE-WALDRON-BLAKE	MO	2	28,300	10
MENFRO-WINFIELD-HAYMOND	MO	7	310	<1
SOIL ASSOCIATIONS SUB TOTAL	--	113	281,050	100
UNCLASSIFIED AQUATIC	ALL	19	56,910	--
SOILS AND AQUATIC TOTAL	--	--	337,960	--



Key Map



10 0 10 20 30 40 Miles

Figure 2-14

Mississippi River:
Hannibal, Missouri to
Lock and Dam 26R

2.14.2 Land Use/Land Cover

2.14.2.1 Land Use

The total area of floodplain in this reach covers 337,960 acres (Table 2.14-2). The floodplain is several miles wide throughout the reach. The river flows from one edge of the floodplain to the other. High bluffs define both sides of the floodplain. The river, along the entire length of the reach, is a series of braided channels and numerous islands. The floodplain widens where the Missouri and Illinois Rivers meet the Mississippi.

The reach is primarily rural with scattered small communities along the riverbanks. Alton, Illinois is the urban area within the reach. The Great River Road is located on the left descending bank of the river in Illinois.

Table 2.14-2

**LAND USE/LAND COVER
MISSISSIPPI RIVER: HANNIBAL - LOCK AND DAM 26R**

Cover Type	Acres	Percent
Urban	6,100	1
Agriculture	202,540	60
Upland Forest	480	< 1
Forested Wetland	47,980	14
Non-Forested Wetland	34,030	10
Water	46,430	14
Barren	400	< 1
Total	337,960	100

2.14.2.2 Vegetation

Floodplain forests are on many of the large islands. Additional large areas of forest are north of Louisiana, Missouri; in Calhoun County, Illinois; and near Foley and Old Monroe, Missouri. The higher areas at the edge of the floodplain are forested fairly consistently on the Illinois side of the river. In Missouri, agriculture and forest are interspersed along the floodplain edge. The entire reach is in the Prairie ecological region. The area is characterized by a combination of bluestem prairie grasses and oak-hickory forest. The prairie is now primarily agricultural lands (Schwartz and Schwartz, 1986).

2.14.2.3 Plant Species of Special Concern

Six plant species of special concern grow in this reach (Table 2.14-2a). Five are in Missouri; one is in Illinois. The decurrent false aster is a Federally-threatened species.

Table 2.14-2a

PROTECTED PLANT SPECIES OF THE MISSISSIPPI RIVER HANNIBAL - LOCK AND DAM 26R

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
Bulrush	--	E	--	St. Charles
Decurrent False Aster	T	E	--	St. Charles(5), Pike Jersey, Madison
European Barberry	--	E	--	St. Charles(2)
Rose Turtlehead	--	E	--	St. Charles, Lincoln, Pike
Salt Meadow Grass	--	--	E	Pike, Calhoun
Star Duckweed	--	R	--	St. Charles

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

2.14.3 Aquatic Resources

2.14.3.1 Wetlands

Within this study reach, approximately 64,570 acres of vegetated wetland are in the adjacent floodplain. The majority are classified as forested wetland (See Table 2.14-3). NWI data was not available for the lower end of the reach.

Table 2.14-3

AQUATIC RESOURCES¹
MISSISSIPPI RIVER: HANNIBAL - LOCK AND DAM 26R

Wetland Class	Acres	Percent
Forested	47,980	75
Shrub/Scrub	2,780	4
Emergent	13,800	21
Water Resources	Acres	Number
Lakes & Ponds	7,110	313

¹Extrapolated from 74 percent coverage.

The vegetated wetlands appear to be concentrated mainly at on the southern end of the river segment. The Ted Shanks SWMA contains a large amount of wetlands. In addition, many of the islands located near this SWMA contain wetlands. The following protected plant and animal species inhabit this area: bald eagle, pied-billed grebe, decurrent false aster, rose turtlehead, king rail, common moorhen, American bittern, and little blue heron. Large forested wetland habitats are located on several islands that have formed within the channel of the Mississippi. Some of the major islands containing significant wetland areas include:

Island	River Mile
Gilbert Island	296
Denmark Island	292
North Fritz Island	288
Cash Island	279
Pharrs Island	276
Clarksville Island	272
Carroll Island	268
Slim Island	265
Mozier Island	260
Turner Island	245
Cuivre Island	235
Dardenne Island	227
Mason Island	220
Pelican Island	210
Dresser Island	206

Denmark Island, nearby the Ted Shanks SWMA, contains great blue heron and great egret rookeries. Carroll Island and Clarksville Island are comprised exclusively of palustrine forested wetlands. Both islands contain bald eagle populations. Clarksville Island contains rookeries for both great blue heron and great egrets. Both of these islands are near the Calhoun County Rip-rap Landing State Conservation Area, which contains both forested and shrub/scrub wetlands.

Mozier Island and Westport Island contain pristine wet bottomland forests as well as wet-mesic bottomlands. Across from Westport Island, Red's Landing Wildlife Area has a heron rookery and includes forested and emergent wetlands. Between RM 250 and RM 255, is a large complex of small islands which contains forested wetlands. Within this area, are great blue heron rookeries as well as habitat supporting the great egret.

North of St. Peters, between RM 240 and RM 223, is a larger wetland area dominated by forested and emergent vegetation communities. The area contains a combination of freshwater marsh, wet prairie, and shrub swamp. The mixture of these three aquatic ecosystems has created good habitat for two Missouri protected species: star duckweed and western fox snake. Most of the wetland habitat in this area is associated with private duck hunting clubs, which are concentrated in St. Charles County.

Near RM 220, Calhoun Point contains palustrine forested wetland. Mason Island, located nearby, also contains wooded wetlands. As a result, the following bird species inhabit these sites: great

egret, great blue heron, and bald eagle. These pristine communities are below Pere Marquette State Park.

The Marais Temps Clair State Wildlife Area is comprised exclusively of palustrine forested and emergent wetlands. Several protected species also occur within this area. Pelican Island and Dresser Island contain hardwood, bottomland plant communities. Bald eagles and decurrent false aster inhabit these islands.

2.14.3.2 Lakes and Ponds

Approximately 313 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 7,110 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is approximately 23 acres. As with the wetland areas, many of these water bodies are found in association with state or Federally-managed lands. Several lakes and ponds are within the Ted Shanks SWMA. Most of the lakes are old oxbows.

The MTNWR (RM 280) contains numerous oxbow lakes and ponds. Across from Louisiana, Missouri, MTNWR also contains a significant amount of wetlands surrounding these water bodies.

Several oxbow lakes and ponds are located between RM 240 and RM 223. In addition, large wetlands areas accompany the many open water systems. Some of the large lakes within this study reach are listed below:

Lake	Location	River Mile
Spring Lake	Louisiana, MO	282
Kings Lake	Foley, MO	249
Maple Lake	N. of O'Fallon, MO	234
Dardenne Lake	N. of O'Fallon, MO	231
Mertz Lake	N. of St. Charles, MO	220

2.14.3.3 Tributaries

Several tributaries empty into the Mississippi River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
Salt River	Louisiana, MO	285
Bay Creek	Clarksville, MO	273
Sixmile Creek	Clarksville, MO	273
Cuivre River	Old Monroe, MO	235
Illinois River	Grafton, IL	218

Wetlands are along most of these tributaries as well as along diversion or agricultural drainage ditches such as the Hadley-McCraney and Kiser Creek Diversion Ditches.

2.14.4 Fisheries

This reach contains a diversity of habitats for aquatic resources. The diversity of habitat in this reach ranges from tailwater fisheries to lake-type habitat to slow moving backwater areas. Major tributaries leading into the Mississippi River throughout this reach include the Cuivre, the Salt and the Illinois Rivers. Major common game species in this reach include the largemouth bass, channel, flathead and bullhead catfish, crappie, white bass, and various species of panfish. Minor species in this reach include walleye, sauger, and northern pike. Species important to the commercial fishery include buffalo, carp, catfish, and freshwater drum. In Pools 24, 25 and 26, a total of 170,000 pounds of fish worth approximately \$56,000 were commercially harvested in 1992 (Robinson, 1994).

Major mussel species in this reach include the threeridge and washboard. Minor species include the Wabash pigtoe and the Missouri state listed rare wartyback. The washboard and threeridge mussels are sought after by commercial mussel fishermen throughout this reach. In 1992, approximately 8,500 pounds of mussels were harvested from this reach, primarily in Pool 24. About 6,300 pounds of washboard and about 2,200 pounds of threeridge mussels made up the catch worth approximately \$8,500 (Koch, 1993).

2.14.4.1 Aquatic Species of Special Concern

Thirteen aquatic species with protected status are known to occur in this reach (Table 2.14-4). Five of the species are mussels and eight are fish. The fat pocketbook mussel is the only species with Federal protection under the Endangered Species Act. The remainder of the species are listed as rare, threatened or endangered by Missouri and/or Illinois. Pool 24 contains the highest number of observations of protected species (11) followed by Pool 26 (7). The fat pocketbook mussel is only found in Pool 24 in this reach; five occurrences have been reported. Two of these occurrences have been reported near the Ted Shanks SWMA in Pike County, Missouri, one is reported from Ralls County near Edward Anderson Wildlife Area; and, three are reported from Pike County, Illinois, also near the Ted Shanks SWMA.

Table 2.14-4

**PROTECTED AQUATIC SPECIES OF THE MISSISSIPPI RIVER
HANNIBAL - LOCK AND DAM 26R**

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
Alligator Gar	--	R	--	St. Charles
Brown Bullhead	--	R	--	St. Charles
Butterfly Mussel	--	--	T	Pike, IL
Fat Pocketbook Mussel	E	E	E	Pike, IL(3), Pike, MO(2), Ralls
Lake Sturgeon	--	E	E	Pike, MO(2), Calhoun
Mooneye	--	R	--	Marion
Rock Pocketbook Mussel	--	R	--	Ralls
Sicklefin Chub	--	R	--	St. Charles
Spectaclecase Mussel	--	E	E	Calhoun
Sturgeon Chub	--	R	E	St. Charles
Trout Perch	--	R	--	Lincoln
Wartyback Mussel	--	R	--	Lincoln
Western Sand Darter	--	--	E	Calhoun

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

2.14.4.2 Important Aquatic Habitat

This reach contains two important tailwater fisheries and three important areas where major tributaries flow into the Mississippi River. Tailwater fisheries exist below each lock and dam in this reach. These tailwaters contain important sport and commercial fisheries. The mouths of the Illinois, Salt and Cuivre Rivers provide important areas where many aquatic species concentrate. Side channels such as Brickhouse Slough and Dardenne Island side channel, both in St. Charles County, provide important resting habitat for the various aquatic species. Stumpfields, near Dresser Island in St. Charles County, provide important spawning habitat for many species. Shallow, sandy bottom areas near the Ted Shanks SWMA in Pike County, Missouri and Pike County, Illinois contain important habitat for the fat pocketbook and other mussel species.

2.14.5 Wildlife

This reach of the Mississippi River provides important habitat for many species of wildlife. The diversity of habitats in this reach ranges from high quality wetland areas to high quality bottomland hardwood forest. White-tailed deer, wild turkey, coyote, beaver, muskrat, and bobwhite quail are abundant throughout this reach. Minor species include the river otter, bobcat, and ring-necked pheasant.

Numerous species of waterfowl and bald eagles are common throughout this reach during migration. At least five million waterfowl pass through this reach each year (Bellrose, 1976). Major waterfowl species in this reach include mallard, wood duck and scaup. Minor species include canvasback, redhead, and goldeneye. This reach of the Mississippi River also provides an important navigational corridor for neotropical migrants.

2.14.5.1 Wildlife Species of Special Concern

Eleven wildlife species with protected status are known to be in this reach (Table 2.14-5). Nine of these species are birds, one is a mammal, and one is a reptile. The bald eagle is the only one with Federal protection under the Endangered Species Act. The remainder of the protected species are listed as rare, threatened or endangered by Missouri and/or Illinois. The pied-billed grebe, bald eagle, king rail, great egret, and American bittern have been observed at every pool in this reach. Pools 24 and 25 contain 13 occurrences of protected species; Pool 26 had 12 occurrences of protected species.

Table 2.14-5

**PROTECTED WILDLIFE SPECIES OF THE MISSISSIPPI RIVER
HANNIBAL - LOCK AND DAM 26R**

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
American Bittern	--	E	E	Pike, MO(2), St. Charles
Bald Eagle	E	E	E	Pike, IL(2), Pike, MO(1), St. Charles, Jer, Calhoun(3)
Barn Owl	--	R	E	St. Charles(3)
Common Moorhen	--	R	T	Pike, MO, St. Charles
Great Egret	--	R	T	Pike, MO(2), Cal(4)
King Rail	--	E	T	Pike, MO(3), St. Charles
Little Blue Heron	--	R	--	Pike, MO
Mississippi Kite	--	R	E	Pike, MO
Pied-Billed Grebe	--	R	T	Pike, MO(3), St. Charles
River Otter	--	--	E	Pike, IL
Western Fox Snake	--	E	--	Lincoln, St. Charles(2)

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

2.14.5.2 Important Wildlife Habitat

Important wildlife habitat occurs throughout this reach. Numerous private duck clubs and state and Federal wetland areas provide important habitat for all of the protected species known to occur in this reach. Eight of the nine species of protected birds are usually found in or near wetlands. Marais Temps Clair State Wildlife Area in St. Charles County; Ted Shanks SWMA and Clarence Cannon National Wildlife Refuge in Pike County, Missouri; MTNWR in Calhoun County, Illinois; Dardenne Lake in St. Charles County; and the Riverlands Conservation Area in St. Louis County all provide important habitat for bald eagles, waterfowl, and river otter.

The various islands occurring throughout this reach provide important habitat for bald eagles and heron rookeries. Heron rookeries are known from all three pools in this reach. Wet-mesic prairie areas in St. Charles County near St. Paul and in Lincoln County near Foley provide important habitat for the western fox snake.

2.14.6 Fish and Wildlife Management Areas

This study reach contains 20 major FWMAs, eleven are in Missouri. Federal wildlife refuges account for five of the 20 FWMA; 12 areas are state-owned (Peterson, 1984). Over 41,723 acres of land and water are within these FWMAs; with 12,542 acres are in the Upper Mississippi Wildlife Area. Eleven protected species inhabit these management areas: king rail, pied-billed grebe, fat pocketbook, common moorhen, American bittern, little blue heron, rose turtlehead, decurrent false aster, bald eagle, barn owl, and western fox snake. The 20 management areas are listed by state in Table 2.14-6; the acreage of each is shown.

Table 2.14-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MISSISSIPPI RIVER: HANNIBAL - LOCK AND DAM 26R**

Management Areas	State	County	Pool	Type	Acres
Upper Mississippi Wildlife Area	MO	***	24-26	S	12,542
Edward Anderson Wildlife Area	MO	Pike, Ralls	24	S	1,046
Dupont Reservation Conservation Area	MO	Pike	24	S	1,320
Ted Shanks State Wildlife Management Area	MO	Pike	24	S	6,636
Clarence Cannon National Wildlife Refuge	MO	Pike	25	F	3,750
Prairie Slough Conservation Area	MO	Lincoln, Pike	25	S	584
Leach Memorial Conservation Area	MO	Lincoln	25	S	918
Sandy Island Conservation Area	MO	Lincoln	25	S	308
Cuivre Island Conservation Area	MO	St. Charles, Lincoln	26	S	454
Borrow Pit Conservation Area	MO	St. Charles	26	S	40
Marais Temps Clair State Wildlife Area	MO	St. Charles	26	S	918
MTNWR** (Delair Division)	IL	Pike	24	F	1,620
MRA* (Red's Landing W.M.A.)	IL	Calhoun	25	S	1,000
MRA* (Rip-Rap Landing W.M.A.)	IL	Calhoun	25	S	10
MTNWR** (Batchtown Division)	IL	Calhoun	25	F	2,750
MRA* (Calhoun Point W.M.A.)	IL	Calhoun	26	S	2,215
MRA* (Eagles Nest Island W.M.A.)	IL	Madison	26	ND	ND
MRA* (Piasa Island W.M.A.)	IL	Madison	26	S	400
MTNWR** (Calhoun Division)	IL	Calhoun	26	F	4,556
MTNWR** (Gilbert Lake Division)	IL	Calhoun	26	F	656
Total Identified Acreage					45,145

Type: Federal (F), State (S), Local (L)

ND = No Data

* Mississippi River State Fish and Wildlife Area

** Mark Twain National Wildlife Refuge

*** Marion, Ralls, Pike, Lincoln, and St. Charles Counties in Missouri

The MTNWR follows the Mississippi River for 250 river miles through Iowa, Illinois, and Missouri. This reach contains approximately 13,300 acres of the refuge, including the Delair, Batchtown, Calhoun, and Gilbert Lake Divisions. Bald eagles, great blue heron, great egrets, and waterfowl use the refuge for some portion of a year (Riley and Riley, 1993). The Illinois-threatened great egret has a heron colony within the refuge.

The Clarence Cannon National Wildlife Refuge, used by the pied-billed grebe, king rail and American bittern, and the bald eagle, is within the MTNWR.

The Ted Shanks SWMA, northwest of Louisiana in Pike County, Missouri, contains 14 lakes, the largest of which is 400 acres. It provides opportunities for hunting, fishing, boating, and camping. Protected species include the fat pocketbook, the decurrent false aster, king rail, American bittern, rose turtlehead, little blue heron, common moorhen, and pied-billed grebe.

Prairie Slough Conservation Area, northwest of the town of Elsberry in Lincoln and Pike Counties, Missouri, contains two lakes and opportunities to hunt small game, waterfowl, turkey, and deer. Protected species inhabiting the area include the Missouri-endangered western fox snake and the rose turtlehead.

Marais Temps Clair State Wildlife Area, north of St. Charles and west of Portage des Sioux, is a conservation area providing opportunities for hunting of small game and waterfowl. The decurrent false aster, western fox snake, common moorhen, king rail, barn owl, and the American bittern are protected species that inhabit this wildlife area (Byrd and Byrd, 1993).

The Upper Mississippi Wildlife Area contains 12,542 acres in Marion, Ralls, Pike, Lincoln, and St. Charles counties in Missouri. Hunting of small game, turkey, deer, and waterfowl are common activities within this wildlife area, along with river fishing and camping. Protected species include the Missouri, Illinois and Federally-endangered fat pocketbook and the Missouri-endangered rose turtlehead.

The Edward Anderson Conservation Area, south of the town of Louisiana in Ralls and Pike Counties, Missouri, provides opportunities for hunting of small game, turkey, deer, and waterfowl.

Cuivre Island Conservation Area is east of Old Monroe in Missouri where the Cuiver and Mississippi Rivers converge. Activities at Cuivre Island include hunting of small game, turkey, deer; fishing; boating; and camping. B.K. Leach Memorial Conservation Area, northeast of Foley, Missouri, offers hunting of small game, deer, turkey, and waterfowl.

2.14.7 Natural Areas

Fifteen natural areas were identified in this study reach. Natural areas cover over 3,000 acres; features include high quality hill prairie bluffs, caves, Indian mounds, shale glades, bottomland forests, sloughs, and shrub-swamp communities. The areas are listed by state, county, pool, ownership, and area in Table 2.14-7.

Table 2.14-7

NATURAL AREAS
MISSISSIPPI RIVER: HANNIBAL - LOCK AND DAM 26R

Natural Areas	State	County	Pool	Type	Acres
DuPont Upland Forest Natural Area	MO	Pike	24	SP	80
Bur-reed Slough Natural Area	MO	Pike	24	S	20
Oval Lake Natural Area	MO	Pike	24	S	20
Salt River Shale Glades	MO	Pike	25	ND	ND
Prairie Slough Natural Area	MO	Lincoln	25	ND	407
Westport Island Natural Area	MO	Lincoln	25	F	480
Drift Island	IL	Pike	24	F	573
Swarnes Hill Prairie	IL	Calhoun	25	ND	34
Riprap Landing Woods	IL	Calhoun	25	ND	195
Cap Au Gris Natural Area	IL	Calhoun	26	P	522
Two Branch Hollow Prairie	IL	Jersey	26	P	8
Principia College Hill Prairie Area	IL	Jersey	26	ND	522
Chautaugua Prairie	IL	Madison	26	S	109
Olin Tract Natural Area	IL	Madison	26	ND	243
Alton Geological Area	IL	Madison	26	P	9
Total Identified Acreage					3,222

Type: Federal (F), State (S), Private (P) ND = No Data

Six of the natural areas are in Missouri. DuPont Upland Forest Natural Area south of Hannibal is a mixed upland hardwood forest and limestone glade on the river. Bur-reed Slough Natural Area and Oval Lake Natural Area are portions of the Ted Shanks SWMA. Bur-reed is a small natural marsh vegetated with giant bur-reed and great bulrush. Terns, bitterns, herons, and rails use the area. Oval Lake is a natural floodplain pond and associated marsh. Furbearers and waterfowl are found in the area as well as a community of river bulrush. Salt River Shale Glades between Louisiana and Ashbar is a statewide significant area featuring highly diverse prairies with patches of open shale glades. The area has patches of scrubby oak stands and is savannah-like in areas. Prairie Slough Natural Area northeast of Elsberry is a statewide significant area that features shrub-swamps, sloughs and wet, and wet-mesic bottomland forest. A state-endangered plant is found in the area. Nearby

Westport Island Natural Area features old growth bottomland forests, sloughs and shrub-swamp communities. Sloughs provide habitat for wood ducks, shorebirds, herons, turtles, and fish (Thom and Iffrig, 1985; Bolger and Nigh, 1986.)

Illinois has nine natural areas in this reach. Drift Island stretches four miles along the Mississippi River and features bottomland forest interspersed with sloughs and chutes from the river. It is managed by the USCOE and USFWS. Swarnes Hill Prairie near Hamburg is a high quality hill prairie near the grave of Captain Swarnes. Rare plants and Indian mounds are found in the prairie which is set high on a limestone cliff overlooking the Mississippi. Riprap Landing Woods northwest of Mozier is high quality bottomland forest and floodplain slough managed by the Illinois Department of Conservation. Cap Au Gris Natural Area south of Batchtown is a high bluff on the river. Hill prairies atop the bluff provide habitat for an endangered grass. The area also has Indian mounds and serves as a wintering area for bald eagles. South of Brussels the Two Branch Hollow Prairie is high quality loess hill prairie on a high limestone cliff.

The Principia College Hill Prairie Area near Elsah is on the Principia College Campus. The 522-acre area has high quality hill prairies and tall limestone cliffs. The cliffs have caves and Indian mounds on the bluffs. The forested bluffs and sheltered hollows serve as a major wintering site for bald eagles. The natural area is used for research and educational field site visits. The Chautaugua Prairie at Chautaugua covers one mile of Mississippi River Bluff. The area features limestone cliffs, Indian mounds and high quality hill prairies. It is a bald eagle wintering site. Six types of geologic formations have been identified at the Chautaugua Prairie. The Olin Tract Natural Area south of Melville features forested bluffs, ravines, a high quality hill prairie and a reproduction of a Piasa Bird on a limestone cliff. It is managed by Southern Illinois University at Edwardsville. The Alton Geologic Area features a large exposure of St. Louis limestone. Saint Genevieve and Peoria loess are also found in the area (INHS, 1994).

2.14.8 Recreation Areas

This study reach contains 12 major recreation areas, the majority of which are in Missouri. State parks and forests account for three of the 12 recreation areas; the remaining 9 are locally-owned. No Federal recreational areas occur within this study reach. Picnicking was the most commonly available recreational opportunity along this study reach. Camping, hunting/fishing, hiking/biking, and water activities were less common. The 12 recreation areas and the activities which they provide are listed in Table 2.14-8.

Table 2.14-8

RECREATION AREAS
MISSISSIPPI RIVER: HANNIBAL - LOCK AND DAM 26R

Recreation Area	State	County	Pool	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Riverview Park	MO	Pike	24	2	L	ND	ND	ND	ND	ND
Louisiana Roadside Park	MO	Pike	24	ND	L	ND	ND	ND	ND	ND
Silo Park	MO	Pike	24	17	L	X	X	--	--	X*
Lock and Dam 22	MO	Ralls	24	2.5	L	--	X	--	--	X*
Sandy Island State Forest	MO	Lincoln	25	308	S	ND	ND	ND	ND	ND
Clarksville City Park	MO	Pike	25	2	L	--	X	X	--	--
Lock and Dam 25	MO	Lincoln	25	ND	L	--	X	--	--	--
Katy Trail State Park	MO	St. Charles	26	ND	S	--	--	--	X	--
Lock and Dam 26	MO	St. Charles	26	10	L	--	X	--	--	X*
Titus Hollow	IL	Calhoun	25	ND	L	--	X	X	X	X*
Pere Marquette State Park	IL	Jersey	26	7,901	S	X	X	X	X	X*
Royal Landing	IL	Calhoun	26	3.5	L	--	X	X	--	X*
Total Identified Acreage				8,246						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Pere Marquette State Park north of St. Louis, just outside of Grafton in Jersey County, Illinois, is the largest area in this study reach. It contains habitat for the bald eagle. The park is dedicated to missionary Jacques Marquette who explored this area with Louis Jolliet in 1673 (American Park Network, 1994).

Sandy Island State Forest, northeast of Winfield in Lincoln County, Missouri, offers stream fishing and camping activities. Small game, deer, turkey, and waterfowl inhabit the forest area, providing many hunting opportunities (Byrd and Byrd, 1993).

Katy Trail State Park, south of Port des Sioux, was built on the abandoned Missouri-Kansas-Texas railroad bed. It is one of the longest "rails to trails" conversions in the U.S. It stretches 200 miles from St. Charles County to Henry County (Byrd and Byrd, 1993).

2.14.9 Data Gaps

The NWI coverage for this reach was 74 percent. This data was extrapolated to provide an estimate for the entire reach. The extrapolated acreage for forested wetlands was then used for the land use/land cover table.

2.14.10 References Cited

American Park Network. 1994. *Illinois State Parks Magazine*.

- Bellrose, F.C. 1976. *Ducks, Geese, and Swans of North America*.
- Bolger, D. and Nigh, T.H. 1986. *Missouri Natural Features Inventory: Lincoln, Pike, St. Charles and Warren Counties*. Missouri Department of Conservation, Jefferson City, MO.
- Byrd B. and Byrd, R. 1993. *Missouri Outdoor Atlas*. Warsaw, MO
- Illinois Natural History Survey. 1995. *Illinois GIS database; unpublished report of Illinois Natural Areas*. Champaign, IL.
- Koch, L. 1993. *1992 Mussel Harvest Report for Missouri*. Missouri Department of Conservation. Columbia, MO.
- Peterson, G.A. 1984. *Resources Inventory for the Upper Mississippi River (Guttenberg, Iowa to Saverton, Missouri)*. Prepared for U.S. Army Corps of Engineers, Rock Island District. Rock Island, IL.
- Riley, L and Riley, W. 1993. *Guide to the National Wildlife Refuges*. MacMillan Publishing Company. New York, NY.
- Robinson, J.W. 1994. *Missouri Commercial Fishery Harvest, 1992*. Missouri Department of Conservation.
- Schwartz, C.W. and Schwartz, E.R. 1986. *The Wild Mammals of Missouri*. University of Missouri Press. Columbia, MO.
- Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.

2.15 ILLINOIS RIVER

This study reach consists of approximately 74 river miles of the Illinois River (See Figure 2-15). The reach begins at the LaGrange Lock and Dam and ends where the Illinois River enters the Mississippi River (RM 218). It flows through eight counties in Illinois. Meredosia and Hardin, Illinois, are the two largest communities along this reach. Apple and Macoupin Creeks are the primary tributaries that enter the Illinois River along this reach.

2.15.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.15-1. Descriptions of the state soil associations are provided in Appendix A.

Table 2.15-1

SOIL ASSOCIATIONS ILLINOIS RIVER

Soil Association	State	Occurrences	Acres	Percent
BEUCOUP-LAWSON-DARWIN	IL	1	148,790	75
PLAINFIELD-SPARTA-OAKVILLE	IL	3	370	<1
WORTHEN-LITTLETON-ELBURN	IL	2	23,630	12
ROZETTA-FAYETTE-HICKORY	IL	55	3,230	2
WAKELAND-BIRDS-BELKNAP	IL	3	11,470	6
PLAINFIELD-BLOOMFIELD-SPARTA	IL	2	9,820	5
ROZETTA-KEOMAH-HICKORY	IL	1	80	<1
SEATON-HICKORY-MT.CARROL	IL	10	80	<1
SOIL ASSOCIATIONS SUB TOTAL	--	77	197,470	100
UNCLASSIFIED AQUATIC	ALL	1	5,860	--
SOILS AND AQUATIC TOTAL	--	--	203,330	--

2.15.2 Land Use/Land Cover

2.15.2.1 Land Use

The total area of floodplain covered by this reach is 203,330 acres (Table 2.15-2). The width of the floodplain ranges from three to five miles. It is even wider at the point where the Illinois River meets the Mississippi. The entire reach is rural with scattered small towns along the river banks.

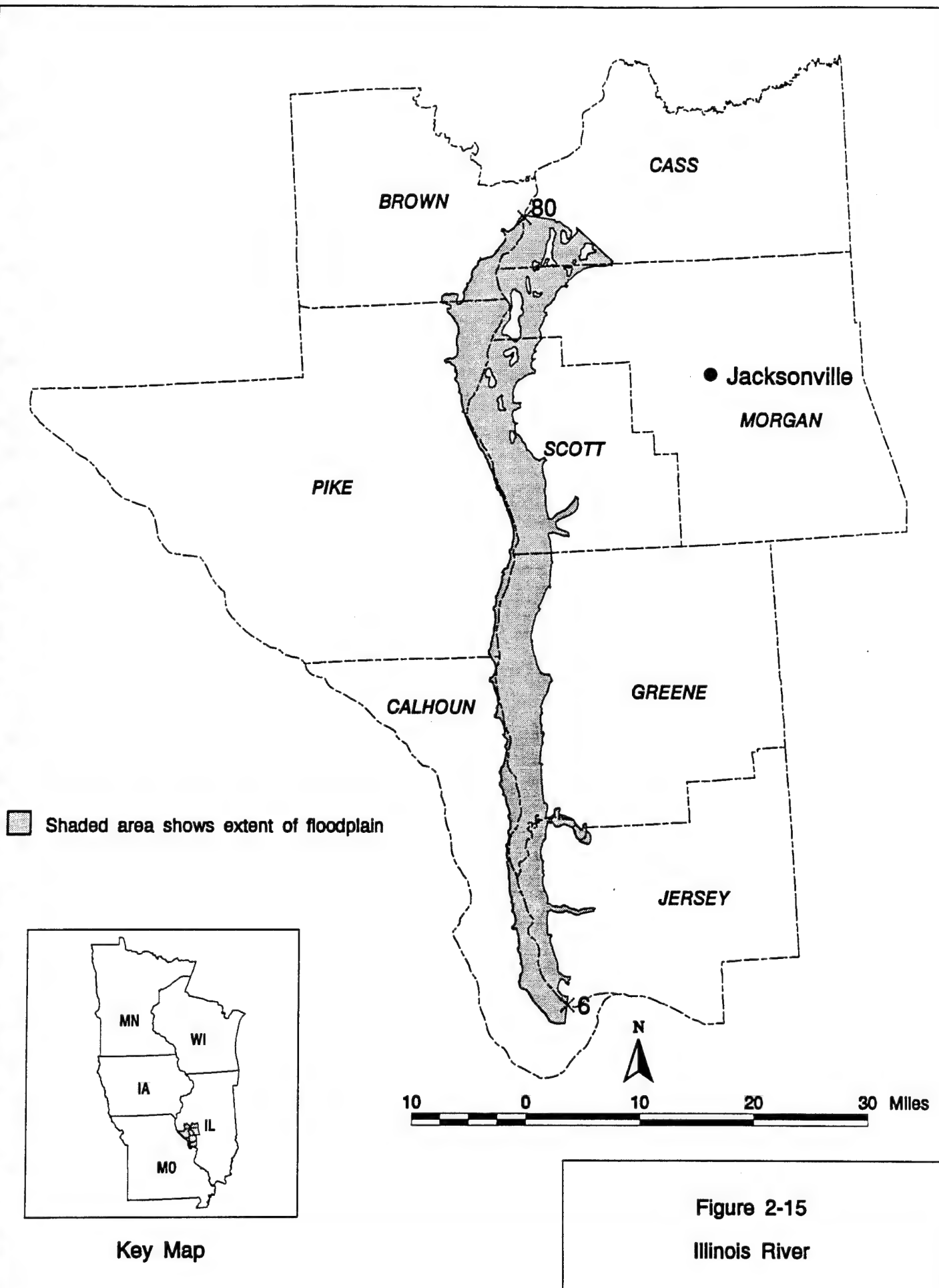


Table 2.15-2

**LAND USE/LAND COVER
ILLINOIS RIVER**

Cover Type	Acres	Percent
Urban	2,280	1
Agriculture	157,520	77
Forest	1,140	< 1
Forested Wetland*	16,980	8
Non-Forested Wetland	10,440	5
Water	14,890	7
Barren	80	< 1
Total	203,330	100

*No NWI data available for forested wetland.

Agriculture is the primary land use along the Illinois River. Levees channel the flood waters, protecting cropland along almost the entire reach.

2.15.2.2 Vegetation

Upland forest is on higher ground at the edge of the floodplain. The forest forms a narrow band on both sides of the river. Other forested areas are around Meredosia Lake and Smith Lake, on Hurricane Island, and in Pere Marquette State Park in Illinois and MTNWR. A variety of oaks, hickory, red and sugar maples, and black walnuts make up these forests (Talkington, 1991).

Wetland forests are found on Hurricane and Diamond Islands near Hardin in Calhoun County, and adjacent to the Pere Marquette State Park. Predominant species found in the floodplain are silver maple and green ash. Other species include pecan, cottonwood, red mulberry, black locust, black willow, and red elm (USFWS, 1987).

2.15.2.3 Plant Species of Special Concern

Three protected plant species are along this reach of the Illinois River (Table 2.15-2a). The decurrent false aster is Federally-threatened and state-threatened in Illinois. The bulrush is endangered in Illinois and the corydalis is threatened in Illinois (Kruse, 1995).

Table 2.15-2a

**PROTECTED PLANT SPECIES
ILLINOIS RIVER**

Species	Federal Status	Illinois Status	Site Occurrences by County
Bulrush		E	Cass
DeCurrent False Aster	T	T	Morgan, Cass, Pike, Jersey, Scott, Greene
Corydalis		T	Scott

E = listed as endangered T = listed as threatened

2.15.3 Aquatic Resources

2.15.3.1 Wetlands

Within this study reach, approximately 20,000 acres of vegetated wetland are present in the adjacent floodplain. The majority are classified as forested wetland (See Table 2.15-3).

Table 2.15-3

**AQUATIC RESOURCES
ILLINOIS RIVER**

Wetland Class	Acres	Percent
Forested	16,980	85
Shrub/Scrub	1,640	8
Emergent	1,380	7
Water Resources	Acres	Number
Lakes & Ponds	6,400	97

Most of the wetlands are along the right descending bank of the river. As a result of the levees, only a small amount of wetlands are on the left descending bank.

The vegetated wetlands appear to be evenly distributed along the river segment. Large forested wetland habitats are on several islands that have formed within the channel of the Illinois River. Major islands containing significant wetland areas include:

Island	River Mile
Hurricane Island	26
Diamond Island	24
Mortland Island	19
Twelvemile Island	14

A large wetland area known as the Glades is at RM 6, near Nutwood. This site is northwest of the Pere Marquette State Park. This area contains approximately 1,500 acres of which about two-thirds is forested wetland; the rest is shrub-scrub and emergent wetlands.

Approximately 2,000 acres of forested wetland surround two large lakes which are located north of Hardin between RM 24 and RM 26. Near the confluence of the Illinois River and Apple Creek (RM 38), a complex of forested wetland is adjacent to the creek.

A mosaic of emergent, shrub/scrub, and forested wetland are at the confluence of Coon Run and McKee Creek (RM 66-69). These wetlands surround a series of lakes. Over 3,000 acres of palustrine forested wetland are between RM 72 and RM 80. The wetland surrounds Meredosia Lake.

2.15.3.2 Lakes and Ponds

Approximately 97 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 6,400 acres. The average size of each pond or lake is approximately 66 acres.

Several large lakes, including Smith Lake, are between Meredosia and Naples (RM 66-69). At least one of these lakes is an old oxbow lake. Several lakes and ponds are located north of Valley City near RM 63. Emergent wetlands surround the majority of these water bodies.

A 27-acre blue hole or scour hole is across from the Pike County State Conservation Area near RM 59. Across from Kampsville, two large linear lakes are riverward of the levee. These lakes are surrounded by forested and shrub/scrub wetland. Meredosia Lake (RM 80) is a large (1,400-acre) water body within the floodplain of the Illinois River.

2.15.3.3 Tributaries

Several tributaries empty into the Illinois River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
McKee Creek	N. of Naples	67
Mauvaise Terre Creek	S. of Naples	63
Sandy Creek	Montezuma	50
Apple Creek	S. of Pearl	38
Macoupin Creek	Hardin	23
Otter Creek	S. of Hardin	15

In addition to these large tributaries, several linear agricultural drainageways are within the reach. In many cases emergent wetlands are adjacent to these drainageways.

2.15.4 Fisheries

The Illinois River contains a diversity of backwater lakes, wetlands, and bottomland forests. Six major tributaries flow into this reach of the Illinois River. All of these tributaries provide important habitat to numerous aquatic species. Over 100 fish species and 25 mussel species are known to occur in this reach of the Illinois River (Talkington, 1991). Major fish species found in this reach include largemouth bass, sauger, flathead and channel catfish, and various species of panfish. Minor fish species found in this reach include walleye and northern pike (Theiling, 1993). Species important to the commercial fishery include carp, buffalo, freshwater drum, and catfish. About 1,000,000 pounds of carp, buffalo, catfish, and drum are commercially harvested each year on the Illinois River with a wholesale market value of over \$250,000 (Talkington, 1991).

Forty-nine species of mussels once flourished in the Illinois River. By 1912, commercial mussel fishermen supplied 15 button factories along the river. Pollution and overharvest have reduced the mussel population to 25 species (Talkington, 1991). Major mussel species known to occur in this reach of the Illinois River include the washboard, the threeridge, and pink papershell.

2.15.4.1 Aquatic Species of Special Concern

A search of the Illinois Natural Heritage database by the Illinois Department of Conservation did not identify any protected aquatic species in this reach.

2.15.4.2 Important Aquatic Habitat

Important habitat along this reach of the Illinois River consists of one tailwater, numerous backwater lakes, side channels, and wetlands. The tailwater below LaGrange, Illinois provides an important concentration area for all fish species. The mouths of Otter, Macoupin, Apple, Hurricane, Sandy, Blue and Indian Creeks all provide important spawning habitat for largemouth and white bass. Swan Lake in Calhoun County; Fowler Lake in Jersey County; Smith Lake in Scott County and, Meredosia Lake in Morgan County provide important habitat for walleye, largemouth bass, and other species.

2.15.5 Wildlife

The forests, wetlands, and shrub-scrub habitats of the Lower Illinois River Valley provide habitat for over 50 species of mammals. Major species include white-tailed deer, opossum, turkey, coyotes, red and gray foxes, and cottontail rabbits. The Illinois River Valley provides important habitat for bald eagles and hundreds of thousands of waterfowl during spring and fall. The backwaters of the Illinois River support 20 species of waterfowl. Mallards, wood ducks, green-winged teal, and widgeons are the major species. Canada and snow geese are commonly seen in spring and fall on the numerous lakes near the Illinois River. Fingernail clams were once abundant throughout the Illinois River. They provided a major food source for diving ducks, but are no longer common.

2.15.5.1 Wildlife Species of Special Concern

The great egret, bald eagle and Illinois chorus frog are the only three protected wildlife species known from this reach (Table 2.15-5). The bald eagle is the only species with Federal protection. The great egret and Illinois chorus frog are listed as threatened in Illinois. The bald eagle is a common transient throughout this reach. The great egret has been observed in Calhoun County near Pere Marquette State Park.

Table 2.15-5

PROTECTED WILDLIFE SPECIES ILLINOIS RIVER

Species	Federal Status	Illinois Status	Site Occurrences by County
Bald Eagle	E	E	Calhoun, Cass Morgan, Greene
Great Egret	--	T	Calhoun, Cass
Illinois Chorus Frog	--	T	Cass, Morgan, Scott

E = listed as endangered

T = listed as threatened

2.15.5.2 Important Wildlife Habitat

Wetlands, backwater lakes, bottomland forests, and the tailwaters below LaGrange provide important habitat for both bald eagles and great egrets. The Meredosia National Wildlife Refuge in Morgan County provides important wetlands for great egrets and open water fishing habitat for bald eagles. Pere Marquette State Park in Jersey County also provides important wintering habitat for bald eagles. The tailwaters of the LaGrange lock usually stay ice-free in winter and provide important fishing habitat for bald eagles. Fowler Lake and the Glades area in Jersey County contain extensive bottomland hardwoods important to all species of wildlife. Smith Lake and Coon Lake, south of Meredosia, provide important wetland habitat for migrating waterfowl and bald eagles. A heron rookery is in Calhoun County near the Calhoun Waterfowl Management Area.

2.15.6 Fish and Wildlife Management Areas

This study reach contains 12 major FWMAs. Federal wildlife refuges account for one of the 12 FWMA; the remaining 11 management areas are state-owned. Over 50 different species of mammals exist within the Illinois River Valley, including opossums, bats, beavers, minks, and coyotes. Mallards, pintails, and green-winged teals are waterfowl that can also be found along the Illinois River. The 12 management areas are listed by state in Table 2.15-6; acreage of each is also provided.

Table 2.15-6

FISH AND WILDLIFE MANAGEMENT AREAS ILLINOIS RIVER

Management Areas	State	County	Type	Acres
Pike County Conservation Area	IL	Pike	S	862
MRA* (Stump Lake WMA)	IL	Calhoun	S	3,580
MRA* (Fuller Lake WMA)	IL	Calhoun	S	1,088
MRA* (12 Mile Island WMA)	IL	Calhoun	S	223
MRA* (The Glades WMA)	IL	Jersey	S	1,591
MRA* (Helmbold WMA)	IL	Calhoun	S	729
MRA* (Diamond Island WMA)	IL	Greene	S	657
MRA* (Godar Refuge WMA)	IL	Greene	S	1,027
MRA* (Hurricane Island WMA)	IL	Greene	S	397
MRA* (Michael WMA)	IL	Greene	S	536
Mark Twain National Wildlife Refuge	IL	Calhoun, Jersey	F	2,800
Meredosia Refuge	IL	Morgan, Cass	S	265
Total Identified Acreage				13,755

Type: Federal (F), State (S), Local (L)

ND = No Data

*MRA = Mississippi River State Fish and Wildlife Area

The MTNWR follows the Mississippi River for 250 miles through Iowa, Illinois, and Missouri. This study reach contains approximately 2,800 acres of the refuge. Wintering bald eagles, great blue heron and great egrets, and several thousand waterfowl inhabit the refuge during different seasons. Wildlife that frequent the area include wild turkeys, golden warblers, foxes, beavers, and coyotes (Riley and Riley, 1993).

South of Valley City, the Pike County Conservation Area is comprised mainly of hickory and oak trees. Activities available within the wildlife area include fishing, hunting, picnicking, and canoeing. Deer and squirrel are common wildlife inhabiting the area. A major winter eagle roost is also present.

Nine divisions of the 24,000-acre Mississippi River State Fish and Wildlife Area (MRA) are within this study reach; they encompass approximately 9,828 acres. They include: Stump Lake, Fuller Lake, 12 Mile Island, The Glades, Helmbold, Diamond Island, Godar Refuge, Hurricane Island, and Michael WMAs. Some of the divisions of MRA offer picnicking, fishing, boat ramps, river access, and hunting of doves, waterfowl, forest game, and upland game. Stump Lake WMA, the largest division of MRA, offers two access areas at Dabbs Road and Deep Lake and good hunting opportunities for waterfowl and forest game.

2.15.7 Natural Areas

This study reach contains two natural areas totalling 64 acres. The areas by county and acreage are listed in Table 2.15-7.

Table 2.15-7

NATURAL AREAS ILLINOIS RIVER

Natural Areas	State	County	Type	Acres
Pere Marquette Geological Area	IL	Jersey	S	13
McAdams Peak Hill Prairie	IL	Jersey	S	51
Total Identified Acreage				64

Type: Federal (F), State (S), Private (P) ND = No Data

Both areas are within the Pere Marquette State Park. The Pere Marquette Geological Area is listed for significant features associated with steep limestone cliffs along the Illinois River. The geologic area is in the McAdams Peak Hill Prairie. The natural area features Indian mounds, loess hill prairie, dry, dry-mesic and mesic upland forests. A site adjacent to this natural area serves as a major night roosting site for wintering bald eagles (Illinois Natural History Survey, 1995).

2.15.8 Recreation Areas

This study reach contains only one major recreation area, the 7,901-acre Pere Marquette State Park, which is north of St. Louis just outside the town of Grafton in Jersey County. The Pere Marquette area contains habitat suitable for the bald eagle. Recreational opportunities available at the park include: lodging, camping, biking, boating, hiking, fishing, horseback riding, hunting, and picnicking. A nature preserve, historic site, and interpretive program are also available (American Park Network, 1994).

Table 2.15-8

**RECREATION AREAS
ILLINOIS RIVER**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Pere Marquette State Park	IL	Jersey	7,901	S	X	X	X	X	X

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

2.15.9 Data Gaps

There were no data gaps for this reach.

2.15.10 References Cited

American Park Network. 1994. *Illinois State Parks Magazine*.

Illinois Natural History Survey. 1995. *Illinois GIS database; unpublished report of Illinois Natural Areas*. Champaign, IL.

Kruse. 1995. *Correspondence*. Illinois Department of Conservation. Springfield, IL.

Riley, and William. 1993. *Guide to the National Wildlife Refuges*. MacMillan Publishing Company. New York, NY.

Talkington, L. M. 1991. *The Illinois River*. University of Illinois at Urbana-Champaign, Division of Printing Services.

Talkington, L.M. 1991. *The Illinois River: Working for Our State*. Illinois State Water Survey. Misc. Publ. 128.

Theiling, C.H. 1993. *An Ecological Overview of the Upper Mississippi River System: Implications for Post Flood Recovery*. Appendix 1-4. Prepared for SAST.

U.S. Fish and Wildlife Service. 1987. *Resource Classification System; Upper Mississippi River National Wildlife and Fish Refuge*.

2.16 MISSISSIPPI RIVER: LOCK AND DAM 26R TO THE MERAMEC RIVER

This study reach is approximately 40 river miles in length (See Figure 2-16). It begins at Lock and Dam 26R (RM 203) and ends where the Meramec River enters the Mississippi River at RM 163. The reach adjoins two states, two counties in Missouri and three counties in Illinois. The St. Louis Metropolitan area which is in both states, is the dominant community along this reach. The Missouri River is the primary tributary entering the river along this reach.

2.16.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.16-1. Descriptions of the state soil associations are provided in Appendix A.

Table 2.16-1

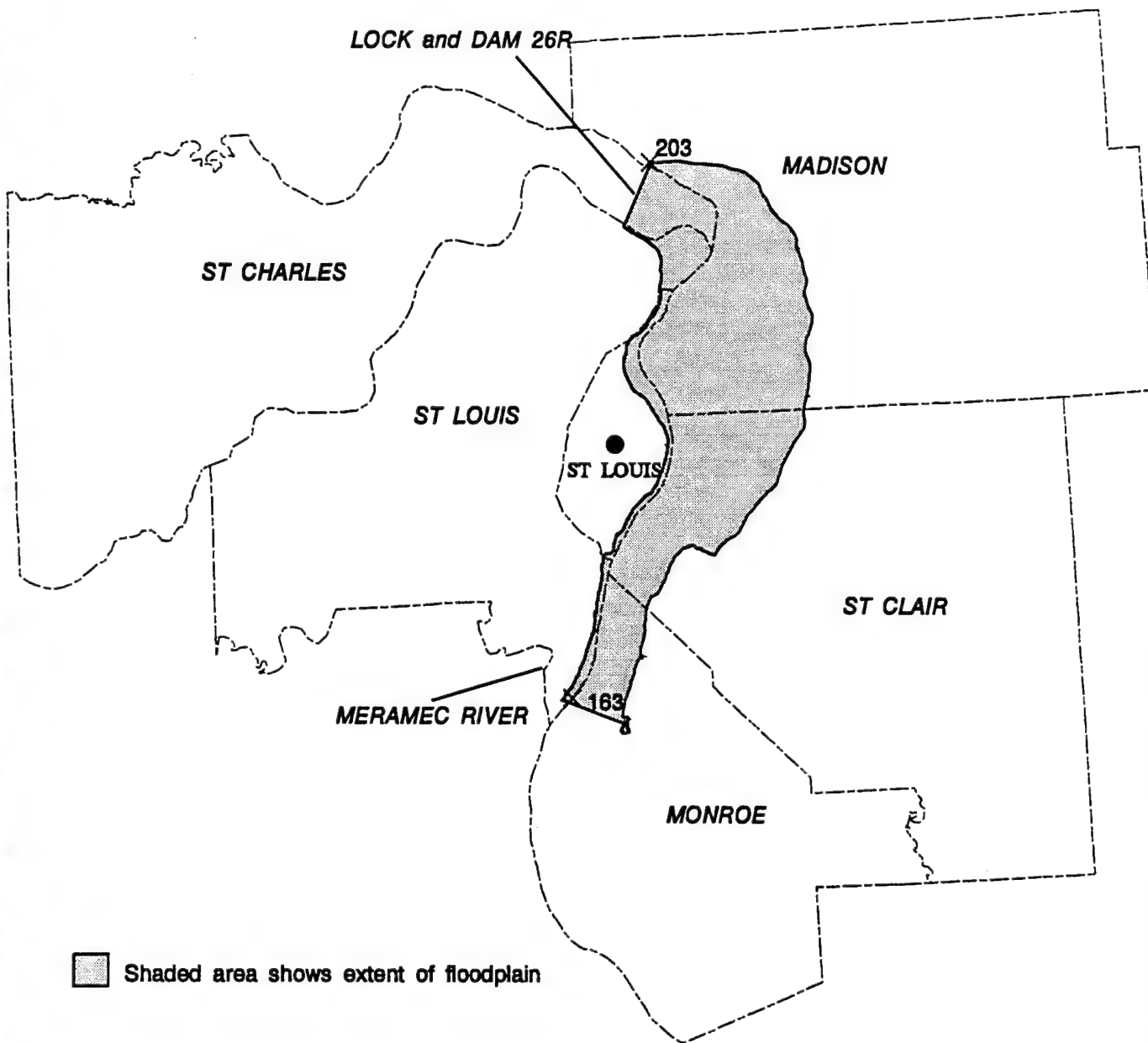
SOIL ASSOCIATIONS MISSISSIPPI RIVER: LOCK AND DAM 26R - MERAMEC RIVER

Soil Association	State	Occurrences	Acres	Percent
WAKELAND-BIRDS-BELKNAP	IL	3	13,300	9
ROZETTA-FAYETTE-HICKORY	IL	9	4,430	3
HURST-REESVILLE-PATTON	IL	1	3,930	3
BEAUCOUP-LAWSON-DARWIN	IL	2	104,590	71
HAYNIE-WALDRON-BLAKE	MO	3	13,760	9
MENFRO-WINFIELD-HAYMOND	MO	3	890	<1
URBAN.LAND-HARVESTER-FISHPOT	MO	4	4,110	3
ALFORD-MUREN-HICKORY	IL	5	2,410	2
SOIL ASSOCIATIONS SUB TOTAL	--	30	147,420	100
UNCLASSIFIED AQUATIC	ALL	2	18,250	--
SOILS AND AQUATIC TOTAL	--	--	165,670	--

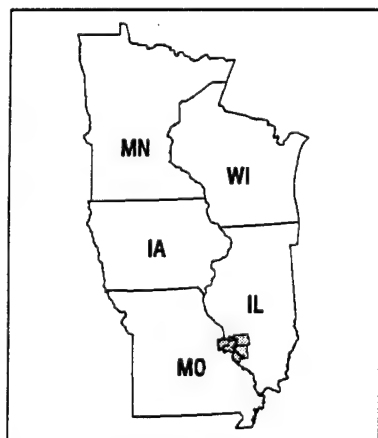
2.16.2 Land Use/Land Cover

2.16.2.1 Land Use

The entire area of the floodplain of this reach covers 165,670 acres. This reach flows through the St. Louis metropolitan area, where it is a narrow, confined channel. North of the St. Louis, the floodplain extends approximately ten miles across the left descending bank. Several large islands are in this reach including Chouteau, Gabaret, and Mosenthein Islands. The Chain of Rocks Canal is adjacent to the natural channel of the river. Land-use information is provided in Table 2.16-2.



Shaded area shows extent of floodplain



Key Map



10 0 10 20 Miles

Figure 2-16

Mississippi River:
Lock and Dam 26R to
the Meramec River

Table 2.16-2

LAND USE/LAND COVER
MISSISSIPPI RIVER: LOCK AND DAM 26R - MERAMEC RIVER

Cover Type	Acres	Percent
Urban	60,490	36
Agriculture	68,770	42
Range	0	--
Upland Forest	90	< 1
Forested Wetland	10,080	6
Non-Forested Wetland	10,910	7
Water	13,870	8
Barren	1,460	< 1
Total	165,670	100

Over one-third of the reach is classified as urban. On the Missouri side, the river flows through downtown St. Louis. Industrial areas including railroad yards and oil refineries are located on the Illinois side of the river. Numerous highways are on both sides of the river.

The majority of the agricultural lands are on the Illinois side of the river. Large areas of agriculture are in Missouri at the confluence of the Missouri River.

2.16.2.2 Vegetation

Small patches of forest are north of St. Louis and at the confluence of the Meramec River. Upland forests are dominated by oaks and hickories; some short-leaved pines are interspersed (Schwartz and Schwartz, 1986). Wetland forest is found on Mosenthein Island. Silver maple and green ash are the dominant floodplain species.

2.16.2.3 Plant Species of Special Concern

Only one species of special concern is found along this reach. The European barberry, a Missouri endangered plant, is found in St. Charles County.

Table 2.16-2a

**PROTECTED PLANT SPECIES OF THE MISSISSIPPI RIVER
LOCK AND DAM 26R - MERAMEC RIVER**

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
European Barberry (Bergia)	--	E	--	St. Charles

E = listed as endangered T = listed as threatened

2.16.3 Aquatic Resources

2.16.3.1 Wetlands

Within this study reach, approximately 17,900 acres of vegetated wetland are in the adjacent floodplain. The majority is classified as forested wetland (Table 2.16-3).

Table 2.16-3

**AQUATIC RESOURCES
MISSISSIPPI RIVER: LOCK AND DAM 26R - MERAMEC RIVER**

Wetland Class	Acres	Percent
Forested	10,080	62
Shrub/Scrub	720	4
Emergent	6,100	34
Water Resources	Acres	Number
Lakes & Ponds	3,620	121

The vegetated wetlands appear to be evenly distributed along the river segment. Large forested wetland habitats are on several islands that have formed within the channel of the Mississippi. Major islands containing significant wetland areas include:

Island	River Mile
Ellis Island	202
Maple Island	200
Mosenthien Island	188

Ellis and Maple Islands are near Alton, Illinois; Mosenthien Island is located near St. Louis, Missouri. A large area of wetlands is below Lock and Dam 26R. This area extends to the confluence of the Missouri River and includes the Riverlands Environmental Demonstration Area and other waterfowl and wildlife areas.

West of Granite City, Illinois, wetland areas are along the Cahokia Drainage Canal and other drainage channels in this area. Although these wetland areas are several miles east of the main river channel, they are still in the Mississippi River floodplain. Wetland areas are also present at the confluence of the Meramec River. They extend from approximately RM 166 to the end of the reach.

2.16.3.2 Lakes and Ponds

Approximately 121 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 3,620 acres. The average size of the lakes is 30 acres. The largest lake in this study area is Horseshoe Lake, which is a large oxbow lake near Granite City, Illinois.

2.16.3.3 Tributaries

Several tributaries empty into the Mississippi River within this reach. Many of these tributaries are small perennial to intermittent streams. However, several larger water ways have their confluence within the river reach. Wetland areas are at the confluence of each of these major tributaries. The following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
Wood River	E. Alton, IL	199
Missouri River	S. of Alton, IL	195
Meramec River	S. of St. Louis, MO	161

2.16.4 Fisheries

Channel catfish, flathead catfish, largemouth bass, white bass, and various species of panfish are the major important game species in this reach. Minor species include walleye, smallmouth bass, and sauger. Species important to the commercial fishery include carp, buffalo, freshwater drum, and catfish.

Common mussel species in this reach include the washboard and the threeridge. Minor species of mussels include the bullhead mussel, deertoe mussel, and pink papershell mussel.

2.16.4.1 Aquatic Species of Special Concern

Two aquatic species with protected status are known to occur in this reach (Table 2.16-4). One of these species is a mussel and one is a fish. The pallid sturgeon is Federally-listed as endangered; Missouri and Illinois also list it as endangered. The pallid sturgeon has been observed near the mouth of the Missouri River in St. Charles County. The butterfly mussel is listed as threatened by Illinois and has been reported from Madison County, Illinois.

Table 2.16-4

**PROTECTED AQUATIC SPECIES OF THE MISSISSIPPI RIVER
LOCK AND DAM 26R - MERAMEC RIVER**

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
Butterfly Mussel	--	--	T	Madison
Pallid Sturgeon	E	E	E	St. Charles

E = listed as endangered T = listed as threatened

2.16.4.2 Important Aquatic Habitat

The tailwater of Lock and Dam 26R and the mouths of the Missouri and Meramec Rivers provide the most important aquatic habitat in this reach. These areas provide concentration sites for small baitfish and phytoplankton, thus attracting other species such as catfish, sickelfin chub, and other important gamefish. The Meramec River provides important spawning and brood rearing habitat for many species including small and largemouth bass. Side channels near Maple Island in St. Charles County and Mosenthien Island in St. Louis County provide important resting areas for a variety of aquatic species.

2.16.5 Wildlife

Much of the habitat for wildlife species on the Missouri side has been commercially or residentially developed. Horseshoe Lake near Cahokia, Illinois provides habitat for many species. Major wildlife species in this reach include white-tailed deer, wild turkey, beaver, coyote, muskrat, and bobwhite quail. Minor wildlife species along this reach include river otter, and bobcat.

Thousands of waterfowl migrate through this area annually. Mallard, wood duck, shoveler, gadwall, widgeon, and Canada geese are the important species. Great blue herons, green herons, cattle egrets, and other shorebirds are also common throughout the summer and during migration.

2.16.5.1 Wildlife Species of Special Concern

Five wildlife species with protected status are known to occur in this reach. Three are birds, one is a mammal and one is a snail. The bald eagle, peregrine falcon and Indiana bat have Federal protection under the Endangered Species Act. The cave snail is listed as endangered in Missouri and is known from St. Louis County near Oakville. A bald eagle night roost is known from this reach in St. Louis County north of the city of St. Louis. The peregrine falcon has also been observed in St. Louis County north of St. Louis.

Table 2.16-5

**PROTECTED WILDLIFE SPECIES OF THE MISSISSIPPI RIVER
LOCK AND DAM 26R - MERAMEC RIVER**

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
Bald Eagle	E	E	E	St. Louis, St. Clair
Cave Snail	--	E	--	St. Louis
Great Egret	--	R	T	Monroe
Indiana Bat	E	E	E	St. Louis
Peregrine Falcon	E	E	E	St. Louis

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

2.16.5.2 Important Wildlife Habitat

Important habitat for bald eagles occurs throughout this reach. The tailwaters of Lock and Dam 26R and the mouths of the Missouri and Meramec Rivers provide important fishing habitat for bald eagles. A major heron rookery is on the left descending bank near the St. Louis metropolitan area. Horseshoe Lake in Madison County, Illinois provides important habitat for migrating waterfowl and eagles. The Riverlands Conservation Areas managed by the USCOE also provides excellent wetland habitat for a variety of wildlife species. Riparian areas below Oakville, Missouri, and near Horseshoe Lake provide important habitat for white-tailed deer and wild turkey. The wooded islands throughout this reach provide important perch trees for eagles and habitat for other wildlife. Tall bluffs near Alton and below St. Louis provide important roosting habitat for the peregrine falcon.

2.16.6 Fish and Wildlife Management Areas

This study reach contains only one major FWMA, the Upper Mississippi Wildlife Area (Table 2.16-6). It is found east of Portage Des Sioux near RM 202 in St. Charles County, Missouri. Within this stated-owned management area are 139 of the total 12,542 acres of the Upper Mississippi Wildlife Area. Activities available along this study reach include hunting of small game, turkey, waterfowl, and deer; fishing; and camping.

Table 2.16-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MISSISSIPPI RIVER: LOCK AND DAM 26R - MERAMEC RIVER**

Management Areas	State	County	Type	Acres
Upper Mississippi Wildlife Area	MO	St. Charles	S	139

Type: Federal (F), State (S), Local (L) ND = No Data

Areas of less significance include the restricted public shooting area and wildlife sanctuary between RM 204.0 and RM 203.5, and an important area for mourning dove between RM 176.0 and RM 173.5 (Peterson, 1984).

2.16.7 Natural Areas

Cliff Caves Natural Area in St. Louis County, Missouri is the only natural area identified within this study reach. The caves are open to the river below (Thom and Iffrig, 1985).

Table 2.16-7

**NATURAL AREAS
MISSISSIPPI RIVER: LOCK AND DAM 26R - MERAMEC RIVER**

Natural Areas	State	County	Type	Acres
Cliff Caves	MO	St. Louis	ND	ND

Type: ND = No Data

2.16.8 Recreation Areas

This study reach contains nine major recreation areas (Table 2.16-8). State parks account for three of the nine recreation areas. One Federal recreation area, Jefferson National Expansion Memorial, is in this study reach. The remaining five recreation areas are locally-owned. Picnicking was the most common recreational opportunity along this study reach. Camping, hunting, fishing, hiking, biking, and water activities were less common. All of the recreation areas within Illinois have boat access; none of the Missouri areas offer boat access.

Table 2.16-8

RECREATION AREAS
MISSISSIPPI RIVER: LOCK AND DAM 26R - MERAMEC RIVER

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Harris Park	IL	Madison	5	L	--	X	X	--	X*
Lewis and Clark State Park (Historic Site)	IL	Madison	14	S	--	X	X	--	X*
Horseshoe Lake State Park	IL	St. Clair	2,854	S	X	X	X	X	X*
Frank Holten State Park	IL	St. Clair	1,180	S	--	X	X	--	X*
North Riverfront Park	MO	St. Louis	112	L	--	--	--	X	--
Jefferson National Expansion Memorial	MO	St. Louis	91	F	ND	ND	ND	ND	ND
Upper and Lower Bellerive Park	MO	St. Louis	6	L	ND	ND	ND	ND	ND
Black Forest Park	MO	St. Louis	4.5	L	--	X	--	--	--
Jefferson Barracks Historical Park	MO	St. Louis	425	L	X	X	--	--	--
Total Identified Acreage			4691.5						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Frank Holten State Park lies within East St. Louis in St. Clair County, Illinois. This urban park contains two fishing lakes, an 18-hole golf course, basketball and tennis courts, a soccer/football field, and baseball diamonds. Groundhogs, foxes, and various wildlife inhabit the park (American Park Network, 1994).

Horseshoe Lake State Park is just north of East St. Louis. The Cahokia Indian mounds are nearby. The park contains waterfowl; opportunities for dove and controlled pheasant hunting, camping, picnicking, fishing, hiking, and cross-country skiing; and a 1,200-acre natural oxbow lake (American Park Network, 1994).

Jefferson National Expansion Memorial, near RM 180, is managed by the NPS in St. Louis. Over 3.5 million people visit the site annually. The park includes the Gateway Arch, a cathedral, and the old courthouse.

2.16.9 Data Gaps

No data gaps were incurred within this reach.

2.16.10 References Cited

American Park Network. 1994. *Illinois State Parks Magazine*.

Peterson, G.A. 1984. *Resources Inventory for the Upper Mississippi River (Guttenberg, Iowa to Saverton, Missouri)*. Prepared for U.S. Army Corps of Engineers, Rock Island District. Rock Island, IL.

Floodplain Management Assessment

Schwartz, C.W. and Schwartz, E.R. 1986. *The Wild Mammals of Missouri*. University of Missouri Press. Columbia, MO.

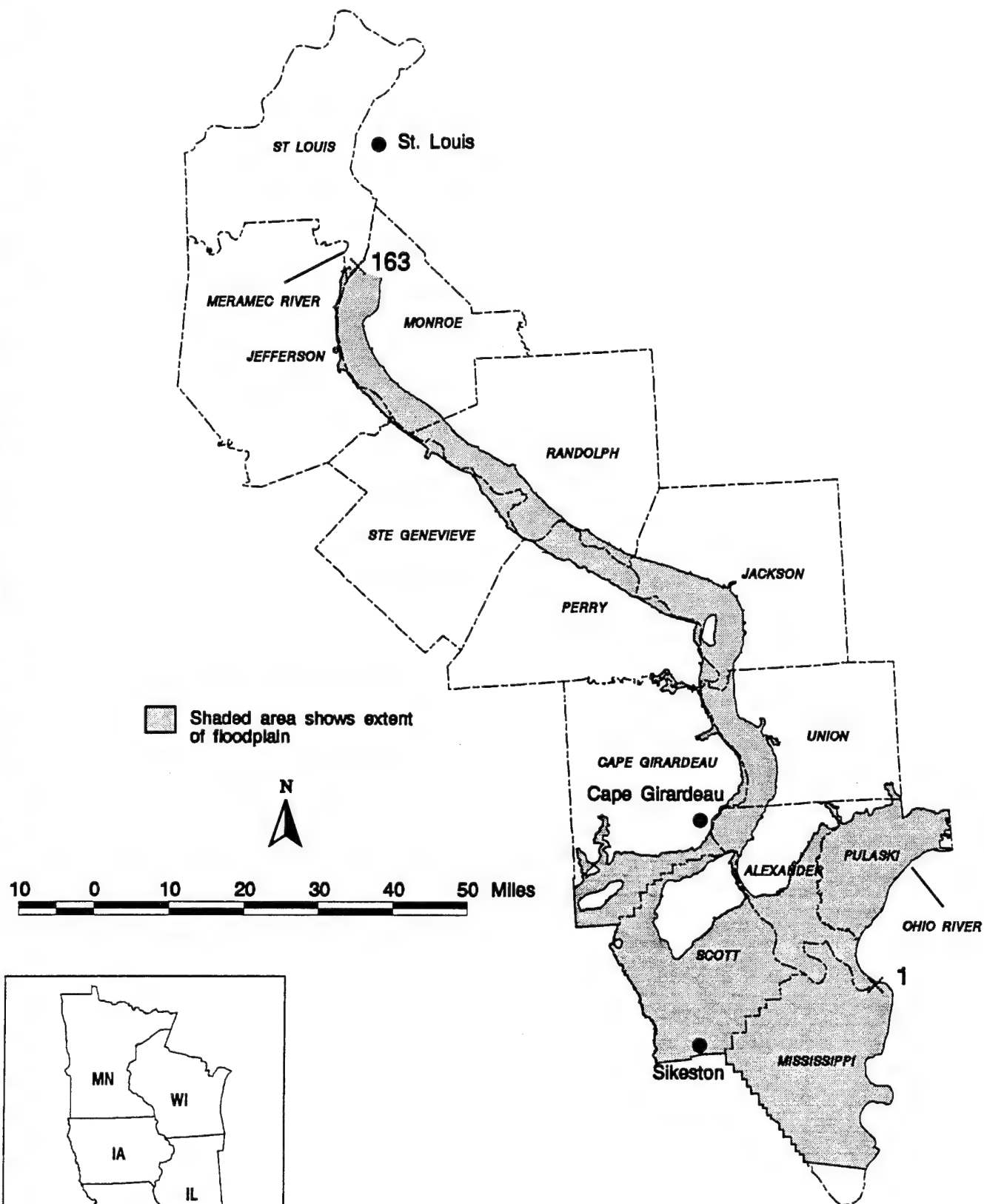
Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, Missouri.

2.17 MISSISSIPPI RIVER: MERAMEC RIVER TO THE OHIO RIVER

This study reach is approximately 162 river miles in length (See Figure 2-17). The reach begins where the Meramec River enters the Mississippi (RM 163), and ends where the Ohio River enters the Mississippi (RM 1). The reach adjoins six counties in Missouri and six in Illinois. The major community along this reach is Cape Girardeau, Missouri. Kaskaskia River is the primary tributary along this reach.

2.17.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 2.17-1. Descriptions of the state soil associations are provided in Appendix A.



Key Map

Figure 2-17
Mississippi River:
Meramec River to the Ohio River

Table 2.17-1

SOIL ASSOCIATIONS
MISSISSIPPI RIVER: MERAMEC RIVER - OHIO RIVER

Soil Association	State	Occurrences	Acres	Percent
ALFORD-MUREN-HICKORY	IL	1	890	<1
ALFORD-SEATON-HICKORY	IL	18	2,490	<1
ALFORD-WELLSTON-WAKELAND	IL	22	6,030	<1
ALVIN-RUARK-ROBY	IL	3	6,610	<1
BEAUCOUP-LAWSON-DARWIN	IL	2	83,150	8
BONNIE-BELKNAP-PIOPOLIS	IL	6	116,000	11
EMMA-SEXTON-MARTINSVILLE	IL	4	22,130	2
GOSS-ALFORD-BAXTER	IL	21	1,550	<1
HOSMER-ZANESVILLE-BELKNAP	IL	4	48,520	5
KARNAK-JACOB-CAIRO	IL	5	124,940	12
WAKELAND-BIRDS-BELKNAP	IL	2	220	<1
AMAGON-DUNDEE-SHARKEY	MO	2	3,710	<1
BOSKET-MALDEN-BROSELEY	MO	3	14,230	1
COMMERCE-SHARKEY-FLUVAQUENTS	MO	11	100,420	9
FALAYA-ADLER-ZACHARY	MO	4	61,730	6
FOLEY-JACKPORT-CROWLEY	MO	1	1,570	<1
GIDEON-SHARKEY-SIKESTON	MO	4	42,580	4
GOSS-PEMBROKE-UNION	MO	1	150	<1
HAYMOND-WILBUR-FREEBURG	MO	10	14,440	1
HAYNIE-WALDRON-BLAKE	MO	6	43,330	4
HAYNIE-WALDRON-BLAKE	MO	1	16,130	1
HILDEBRECHT-WEINGARTEN-GOSS	MO	3	1,560	<1
LILBOURN-WARDELL-DUNDEE	MO	7	58,990	5
LILY-MINNITH-JONCA	MO	2	1,140	<1
LORING-POYNOR-WEINGARTEN	MO	16	1,950	<1
MEMPHIS-LORING-FALAYA	MO	2	60,360	6
MENFRO-CLARKSVILLE-HAYMOND	MO	21	880	<1
MENFRO-WINFIELD-HAYMOND	MO	45	3,180	<1
SCOTCO-CLANA-MALDEN	MO	3	56,690	5
SCOTCO-CLANA-MALDEN	MO	1	47,560	4
SHARKEY-STEELE-TUNICA	MO	6	133,850	12
SOIL ASSOCIATIONS SUBTOTAL		237	1,076,980	100
UNCLASSIFIED AQUATIC	ALL	22	54,540	-
SOILS AND AQUATIC TOTAL		-	1,131,520	-

2.17.2 Land Use/Land Cover

2.17.2.1 Land Use

The total area of the floodplain of this reach covers 1,131,520 acres (Table 2.17-2). The floodplain is a consistent width along the river until the confluence of the Ohio River, south of Cape Girardeau. At this point the floodplain expands to encompass portions of Alexander and Pulaski Counties in Illinois; and Scott, Mississippi, and Cape Girardeau Counties in Missouri.

Table 2.17-2

LAND USE/LAND COVER¹
MISSISSIPPI RIVER: MERAMEC RIVER - OHIO RIVER

Cover Type	Acres	Percent
Urban	22,820	2
Agriculture	747,640	66
Range	0	--
Upland Forest	76,360	7
Forested Wetland	100,530	9
Non-Forested Wetland	120,500	10
Water	60,910	5
Barren	2,760	2
Total	1,131,520	100

¹Based on 91 percent coverage.

Several urban areas are along this reach including Chester and Cairo, Illinois and Cape Girardeau and St. Genevieve, Missouri. Many small communities are located throughout this reach. Some of the roads in Illinois are designated as part of the Great River Road, the longest scenic byway in the country.

Mississippi lowlands lie south of Cape Girardeau (Schwartz and Schwartz, 1986). The lowlands are crisscrossed with tributaries and drainage channels which drain the lowlands for agriculture. The largest single land use along this reach is agriculture. Extensive agricultural areas are found throughout the reach.

2.17.2.2 Vegetation

This reach lies in two geographical regions, each with different native species. North of Cape Girardeau is the Ozark Highland region, where oak and hickory forests are native (Schwartz and Schwartz, 1986). Forested land is along the edges of the floodplain north of the Ohio River confluence. The southern portion of the reach is a patchwork of agriculture and forest land. Forested areas are found along the drainages and on ground too steep for agriculture.

2.17.2.3 Plant Species of Special Concern

Only one plant species of special concern is within this reach. The weak nettle is a Missouri endangered species.

Table 2.17-2a

**PROTECTED PLANT SPECIES OF THE MISSISSIPPI RIVER
MERAMEC RIVER - OHIO RIVER**

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
Weak Nettle	--	E	--	Perry

E = listed as endangered

T = listed as threatened

2.17.3 Aquatic Resources

2.17.3.1 Wetlands

Within this study reach, there are approximately 128,660 acres of vegetated wetland in the adjacent floodplain. The majority is classified as forested wetland (Table 2.17-3).

Table 2.17-3

AQUATIC RESOURCES¹
MISSISSIPPI RIVER: MERAMEC RIVER - OHIO RIVER

Wetland Class	Acres	Percent
Forested	100,530	78
Shrub/Scrub	7,620	6
Emergent	20,500	16
Water Resources	Acres	Number
Lakes & Ponds	2,870	132

¹Extrapolated from 73 percent coverage.

Vegetated wetlands appear to be evenly distributed along the river segment. Large forested wetland habitats are on several islands that have formed within the channel of the Mississippi. Some of the major islands containing significant wetland areas are listed below:

Island	Location	River Mile
Calico Island	E. of Crystal City, MO	144
Moro Island	St. Genevieve, MO	121
Kaskaskia Island	St. Genevieve, MO	118
Liberty Island	E. of Chester, IL	107
Jones Towhead	E. of Chester, IL	96
Devils Island	Cape Girardeau, MO	58
Cape Bend	Cape Girardeau, MO	50
Goose Island	Alexander, IL	36
Bumgard Island	Alexander, IL	30
Browns Bar	Alexander, IL	23
Angelo Towhead	Cairo, IL	4

Wetland areas between Festus, Missouri and St. Genevieve, Missouri. These wetlands are mainly along the left descending bank of the river and are associated with numerous river islands, oxbow lakes, and old river channels.

An important wetland area is located south of St. Genevieve, Missouri, at the confluence of the Kaskaskia River. This area includes the Mississippi Kite Natural Area, Kaskaskia River Fish and Wildlife Area, and Kaskaskia Island. Nearly 2,000 acres of wetlands are present on Kaskaskia Island; the wetlands are heavily used by great blue herons, great egrets, and migratory birds.

Another wetland area south of St. Genevieve, Missouri, is at the confluence of the Mary's River. This area includes the Turkey Bluff State Fish and Wildlife Area and Mary River Woods Natural Area, which are both managed by the Illinois Department of Conservation.

Several wetland areas are in Union County, Illinois. Oakwood Bottoms, between RM 79 and RM 83, is managed by the U.S. Forest Service as part of the Shawnee National Forest. This area provides habitat for migratory and wintering waterfowl as well as other wildlife. The Larue Swamp in Illinois is also within the Shawnee National Forest, between RM 73 and RM 75. This Mississippi River bottomland provides important waterfowl habitat; several state and Federally-listed endangered species inhabit the area.

The Union County Conservation area is also, north of Cape Girardeau between RM 63 and RM 73; it is in the adjacent floodplain east of the river. In this area several wetland areas and small lakes receive heavy waterfowl use. Devils Island, which is south of the conservation area, also receives heavy waterfowl use.

Horseshoe Lake and the Horseshoe Lake Conservation Area are located north of Cairo, Illinois. Wetland areas are present to the south and east of this lake. Wetland areas are also present at the confluence of the Ohio River.

2.17.3.2 Lakes and Ponds

Approximately 132 individual lakes and ponds are located within the river segment. The total surface area of these lakes and ponds is approximately 2,870 acres. Many of these lakes have some degree of associated wetland areas. The following is a list of the largest lakes and their locations:

Lake	Location	River Mile
Moredock Lake	N. of Festus, MO	156
Tower Island Chute	N. of Cape Girardeau, MO	78
Bluff Lake	N. of Cape Girardeau, MO	60
Horseshoe Lake	N. of Cairo, IL	35

2.17.3.3 Tributaries

Several tributaries empty into the Mississippi River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
Kaskaskia River	S. of St. Genevieve, MO	118
Mary's River	S. of St. Genevieve, MO	106
Big Muddy River	N. of Cape Girardeau, MO	76
Ohio River	Cairo, IL	0

2.17.4 Fisheries

The Mississippi River below Lock and Dam 26 is considered open river. Wing dikes, riprapped banks and side channels provide a diversity of aquatic habitat throughout this reach. Major species found in this reach include channel catfish, blue catfish, largemouth bass, white bass, and sauger (Rasmussen, 1979). Minor species known to be in for this reach include walleye, spotted bass, and smallmouth bass. Species important to the commercial fishery include the catfishes, carp, buffalo, and drum. In 1992, over 3,000 pounds of carp, over 15,000 pounds of buffalo and over 40,000 pounds of catfish were harvested from this reach in Missouri (Robinson, 1994). On the Illinois side, over 23,000 pounds of carp, over 135,000 pounds of buffalo and over 120,000 pounds of catfish were harvested from this reach (Dufford, 1994).

Major mussels species found in this reach include the washboard, threeridge, and pink papershell. Minor species of mussels known from this reach include the stout floater and fawnsfoot. No commercial mussel harvest information was available for this reach.

2.17.4.1 Aquatic Species of Special Concern

Ten aquatic species with protected status are known to occur in this reach (Table 2.17-4). Nine of these species are fish and one is a crayfish. The pallid sturgeon is the only species with Federal protection. The remainder of the protected species are listed as threatened, endangered or rare in Missouri or Illinois. Randolph County, Illinois and Perry County, Missouri have the highest number of occurrences of protected species (5), followed by Jackson County, Illinois (4). The pallid and lake sturgeons are both known to occur in Perry County, Missouri. The pallid sturgeon is also known from Randolph County. Three occurrences of an endangered crayfish have been reported in Randolph County, Illinois.

Table 2.17-4

**PROTECTED AQUATIC SPECIES OF THE MISSISSIPPI RIVER
MERAMEC RIVER - OHIO RIVER**

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
Alabama Shad	--	R	--	Perry(2)
Big Eye Shiner	--	--	E	Jackson
Brown Bullhead (Fish)	--	R	--	Cape Girardeau
Crayfish	--	--	E	Jackson Randolph(3)
Lake Sturgeon	--	E	E	Perry
Mooneye	--	R	--	Cape Girardeau Perry
Pallid Sturgeon	E	E	E	Perry Randolph
Sicklefin Chub	--	R	--	Cape Girardeau
Sturgeon Chub	--	R	E	Jackson
Western Sand Darter	--	--	E	Jackson Randolph

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

2.17.4.2 Important Aquatic Habitat

Important aquatic habitat consists of wing dikes, riprap banks, backwater areas, side channels and areas where major tributaries flow into the Mississippi River. Twenty-three sidechannels are between St. Louis, Missouri and Cairo, Illinois. The Kaskaskia and Mary's Rivers provide important spawning habitat for many aquatic species. The Santa Fe Chute south of Cape Girardeau and Picayune Chute north of Cape Girardeau provide important areas for the mooneye and brown bullhead. Side channels near Kaskaskia Island in St. Genevieve County, Missouri and Towhead Island in Randolph County, Illinois provide important habitat for a variety of aquatic species.

2.17.5 Wildlife

This reach contains large acreages of wetland and some bottomland hardwood because the elevation of this area is low. Much of the area is intensively farmed and contains little habitat for wildlife. Many species of waterfowl are common throughout this reach. Major species include Canada geese, mallards, and wood ducks. Minor species include canvasbacks and pintails. Bald eagles are

commonly seen throughout this reach and are known to the west of this area. Other common wildlife species known to occur in this reach include white-tailed deer, wild turkey, cottontail rabbits, and many species of furbearing mammals.

2.17.5.1 Wildlife Species of Special Concern

Seven protected wildlife species are known to occur in this reach (Table 2.17-5). Five of these species are birds, one is a reptile and one is a crayfish. The least tern and the bald eagle are the only two species with Federal protection under the Endangered Species Act. The Mississippi kite has been observed near Cape Girardeau and south of Commerce, in Scott County, Missouri. Both the Mississippi kite and bald eagle have nested within the Union County Conservation Area in Union County, Illinois (USCOE, 1995). A bald eagle night roost is south of Crystal City, in Jefferson County, Missouri. A siting of the great egret is also reported from south of Crystal City. The barn owl has been observed near Chester in Perry County Illinois.

Table 2.17-5

PROTECTED WILDLIFE SPECIES OF THE MISSISSIPPI RIVER MERAMEC RIVER - OHIO RIVER

Species	Federal Status	Missouri Status	Illinois Status	Site Occurrences by County
Bald Eagle	E	E	E	Jefferson, Monroe
Barn Owl	--	R	E	Perry
Crayfish	--	--	E	Randolph
Great Egret	--	R	T	Jefferson, Monroe
Illinois Chorus Frog	--	--	T	Alexander
Least Tern	E	--	E	Alexander
Mississippi Kite	--	R	E	Cape Girardeau Scott, Alexander

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

2.17.5.2 Important Wildlife Habitat

Forested islands, wetland areas, bottomland hardwood areas, side channels, and old oxbows provide important wildlife habitat throughout this reach. Kaskaskia Island near Chester, Illinois provides important resting habitat for bald eagles and Mississippi kites. Wetland areas near Horseshoe Lake in Illinois and Bumgard Island in Scott County, Missouri provide important habitat for great egrets, bald eagles, Mississippi kites, and river otters. Historically, swamp rabbits have been observed near Dogtooth Island in Mississippi County. The many sandbars and islands occurring throughout this reach provide important habitat for migrating Canada geese and other species of waterfowl. Historical records of least terns are also known from this reach near Griffith Island in Scott County.

Floodplain Management Assessment

The 1,200-acre LaRue Swamp, which is part of the Shawnee National Forest in Union County, Illinois, is one of the few unspoiled examples of Mississippi River bottomland forest left in the nation. LaRue Swamp also supports numerous spring-fed scrub-shrub and emergent wetlands.

Two heron rookeries are south of Crystal City in Monroe County, Missouri and near Ware in Union County, Illinois. The great egret has been observed in both of these rookeries.

2.17.6 Fish and Wildlife Management Areas

This study reach contains 11 major FWMAs, the majority of which are found in Missouri. Eight of these areas are state-owned; the ownership of three is undetermined. No Federal management areas are within this reach. Over 20,000 acres of land and water are within the FWMAs. The 11 management areas are listed by state in Table 2.17-6; their acreage is also provided.

Table 2.17-6

FISH AND WILDLIFE MANAGEMENT AREAS MISSISSIPPI RIVER: MERAMEC RIVER - OHIO RIVER

Management Areas	State	County	Type	Acres
Union County Conservation Area	IL	Union	S	6,202
Turkey Bluffs State Fish and Wildlife Area	IL	Randolph	S	2,264
Horseshoe Lake Conservation Area	IL	Alexander	S	9,550
Teszars Woods Conservation Area	MO	Jefferson	S	91
Magnolia Hollow Conservation Area	MO	Ste. Genevieve	S	1,751
Seventy-six Conservation Area	MO	Perry	S	818
Apple Creek Conservation Area	MO	Cape Girardeau	S	2,100
Juden Creek Conservation Area	MO	Cape Girardeau	ND	8
Lake Girardeau Wildlife Area	MO	Cape Girardeau	S	351
Upper Big Lake Conservation Area	MO	Mississippi	ND	160
Ten Mile Pond Wildlife Area	MO	Mississippi	S	3,882
Total Identified Acreage	ALL	--	--	27,177

Type: Federal (F), State (S), Local (L) ND = No Data

Union County Conservation Area, southwest of Jonesboro in Union County, Illinois, contains a large number of sloughs and other water bodies. Thousands of Canada geese winter in the conservation area. Common activities include boating, fishing, and hunting.

Turkey Bluffs State Fish and Wildlife Area is south of Chester in Randolph County, Illinois. Hiking, picnicking, hunting, horseback riding, and wildlife viewing are activities available at this site.

The Horseshoe Lake Conservation Area, located northwest of Cairo in Alexander County, Illinois, is known for its tupelo, swamp cottonwood, and cypress trees. Canada goose hunting and bald eagle observation are two of the activities provided at the Horseshoe Lake area.

Ten Mile Pond Conservation Area, southeast of East Prairie, is the largest FWMA in Missouri within this study reach. Common outdoor activities at this site includes hunting, fishing, boating, and camping.

Apple Creek Conservation Area, east of New Wells, has hunting, fishing, and boating opportunities available, as well as a shooting range.

2.17.7 Natural Areas

Twelve natural areas totalling over 3,000 acres were identified in this study reach (Table 12.17-7). Features included within the natural areas are dry mesic forest, western mesophytic forest, bottomland forest, old growth cypress, hill prairie and sandstone outcrops. Four of the areas in Illinois are considered national natural landmarks.

Missouri has four natural areas listed in this study reach. Brickery's Hollow Area is a dry-mesic forest interspersed with other forest types. The area also features glades and dolomite ridges overlooking the river (Anderson, 1994). Tower Rock Natural Area is a portion of Tower Rock State Park which is south of Wittenberg. The area features upland forest and a small natural limestone formation in the river. Tower Rock, a national historic site, can be seen from the natural area. Kelso Sanctuary Natural Area is a part of Kelso Wildlife Sanctuary near Cape Girardeau. The area features a mesophytic tulip-poplar-beech forest set on north-facing slopes. This is the western limit of this forest type which is typical in the eastern U.S. Vancill Hollow Natural Area is a 300-acre portion of the Trail of Tears State Park. Rough riverbreak terrain supports an unusual western mesophytic forest. The area features a diverse array of ferns (Thom and Iffrig, 1985).

Table 2.17-7

NATURAL AREAS
MISSISSIPPI RIVER: MERAMEC RIVER - OHIO RIVER

Natural Areas	State	County	Type	Acres
Brickery's Hollow Area	MO	St. Genevieve	P	1,200
Tower Rock Natural Area	MO	Perry	S	22
Kelso Sanctuary Natural Area	MO	Cape Girardeau	P	23
Vancill Hollow Natural Area	MO	Cape Girardeau	S	300
Fults Hills Prairie Nature Preserve	IL	Monroe	S	ND
Mary River Woods Natural Area	IL	Randolph	S	43
Mississippi Kite Natural Area	IL	Randolph	S	180
Garrison Hill Cemetery	IL	Randolph	S	40
Little Grand Canyon Area	IL	Jackson	F	ND
The Larue-Pine Hills Ecological Area	IL	Union	F	1,200
Horseshoe Lake Natural Preserve	IL	Alexander	F	ND
Kidd Lake Nature Preserve	IL	Monroe	S	ND
Total Identified Acreage	ALL	—	--	3,008

Type: Federal (F), State (S), Private (P) ND = No Data

Illinois has seven natural areas. Four areas are designated as national natural landmarks (NPS, 1994). Fults Hill Prairie Nature Preserve south of St. Louis is noted as the largest highest quality loess hill prairie along the Mississippi River. The Preserve is designated a national natural landmark. Mary River Woods Natural Area south of Chester is a small area within the Turkey Bluffs State Fish and Wildlife Area.

The Mississippi Kite Natural Area near Kaskaskia features floodplain forest. The forest is important as habitat for two species of state endangered birds. Garrison Hill Cemetery is within Fort Kaskaskia State Park, is a 40-acre dry-mesic upland forest. The Little Grand Canyon Area, west of Carbondale, is a national natural landmark. The area is a box canyon. Diverse ecosystems and habitats include sand outcrops, overhangs, ravine, slope forest, dry oak-hickory forest, hill prairies, and vertical overhanging walls. The ravine is well-known for the variety of snakes that hibernate in the area. The Larue-Pine Hills Ecological Area near Commerce is one of the few unspoiled Mississippi River bottomland ecosystems remaining. The area provides habitat for Federal and state endangered species. The area is within the Shawnee National Forest and is listed as a national natural landmark. The Horseshoe Lake Natural Preserve northwest of Cairo is a state-owned national natural landmark. The area features mature stands of bald cypress and diverse floral and faunal communities. The site serves as an overwintering area for thousands of Canada geese (Illinois Natural History Survey, 1995).

2.17.8 Recreation Areas

This study reach contains eleven major recreation areas, the majority of which are in Illinois. Three Federal recreation areas, the Turkey Bayou/Oakwood Bottoms Recreation Area Pine Hills Recreation Area, and Shawnee National Forest, occur within this study reach. State parks and forests account for the remaining nine recreation areas. Hunting/fishing and hiking/biking activities were the most commonly available recreational opportunities along this study reach. Camping, picnicking, and water activities were less common. The eleven recreation areas and the activities which they provide are listed in Table 2.17-8 (Byrd and Byrd, 1993).

Table 2.17-8

RECREATION AREAS MISSISSIPPI RIVER: MERAMEC RIVER - OHIO RIVER

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Turkey Bayou/Oakwood Bottoms Recreation Areas	IL	Jackson	ND	F	X	--	X	X	X*
Devils Backbone State Park	IL	Jackson	ND	S	ND	ND	ND	ND	ND
Pine Hills Recreation Area	IL	Union	3,292	F	--	--	X	X	--
Trail of Tears State Forest	IL	Union	5,094	S	ND	ND	ND	ND	ND
Shawnee National Forest	IL	Jackson, Union, Pulaski, Alexander	264,085	F	ND	ND	ND	ND	ND
Fort DeChartres State Park	IL	Randolph	1,100	S	--	--	X	X	--
Fort Kaskaskia State Park	IL	Randolph	258	S	X	X	--	--	--
Fort Defiance State Park	IL	Alexander	1,950	S	--	--	X	X	X*
Trail of Tears State Park	MO	Cape Girardeau	3,718	S	X	X	X	X	X*
Magnolia Hollow State Park	MO	Ste. Genevieve	1,286	S	ND	ND	ND	ND	ND
Big Oak Tree State Park	MO	Mississippi	1,004	S	--	--	X	X	X
Total Identified Acreage	ALL	--	281,787	--	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Shawnee National Forest covers parts of Jackson, Union, Pulaski, and Alexander Counties, Illinois. It was created in the 1930's. The Big Oak Tree State Park, south of East Prairie in Mississippi County, Missouri, contains some of the biggest oak trees of their species. Many recreational opportunities exist, including hiking, picnicking, boating, canoeing, and fishing on the lake contained inside the park. The Trail of Tears State Forest, northwest of Jonesboro in Union County, Illinois, provides facilities for hiking, camping, hunting, picnicking, and horseback riding.

2.17.9 Data Gaps

The NWI data covered approximately 73 percent of the reach. The totals for each category were extrapolated uniformly to provide an estimate of the total acreage. This extrapolated data for forested wetlands was used in the land use/land cover table. No data on the commercial harvest of mussels was available.

2.17.10 References Cited

- American Park Network. 1994. *Illinois State Parks Magazine*.
- Anderson, C. 1994. *Missouri Natural Features Inventory: Iyon, Ste. Genevieve and St. Francois counties*. Missouri Department of Conservation, Jefferson City, Missouri.
- Byrd, B. and Byrd, R. 1993. *Missouri Outdoor Atlas*. Warsaw, MO
- Dufford, D.W. 1994. *1992 Commercial Catch Report Exclusive of Lake Michigan*. Illinois Department of conservation, Springfield, IL.
- Illinois Natural History Survey. 1995. *Illinois GIS database; unpublished report of Illinois Natural Areas*. Champaign, IL.
- National Park Service. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance*.
- Rasmussen, J. L. 1979. *A Compendium of Fishery Information on the Upper Mississippi River*. Upper Mississippi River Conservation Committee.
- Robinson, J.W. 1994. *Missouri Commercial Fishery Harvest, 1992*. Missouri Department of Conservation. Columbia, MO.
- Schwartz, C. W. and Schwartz, E. R. 1986. *The Wild Mammals of Missouri*. University of Missouri Press, Columbia, MO.
- Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.
- U.S. Army Corps of Engineers. 1995. *Personal Communication*. St. Louis District, St. Louis, MO.

**3.0 ENVIRONMENTAL RESOURCES
LOWER MISSOURI RIVER BASIN**

3.0 ENVIRONMENTAL RESOURCES LOWER MISSOURI RIVER BASIN

3.1 OVERVIEW

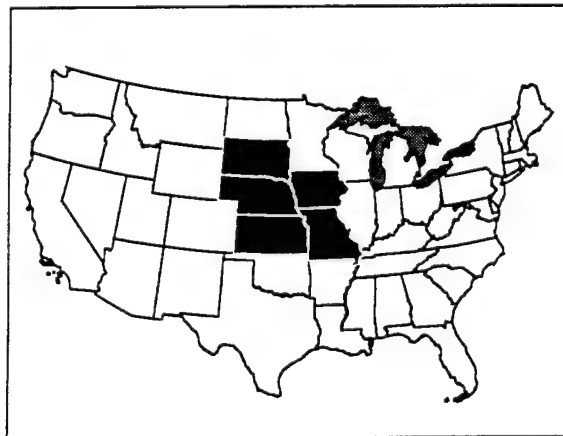
This section of the Environmental Resource Inventory (ERI) contains descriptions of the environmental resources found within the floodplain of the river reaches within the Missouri River portion of the study (see Figure 3-1). The descriptions are presented in sequence from the upper end of the study area in Nebraska and South Dakota down to the confluence with the Mississippi River.

Each subsection contains a profile of the environmental resources found in a particular reach, as well as an inventory of the fish and wildlife management areas, natural areas, recreation areas, and forests within the reach.

The definition of each resource and the primary source of data were provided in the introduction. Complete coverage was not available for all types of data. Therefore, the last item in the descriptions is a discussion of any data gaps and how they affected the presentation. Each section contains a list of the specific references cited for that reach. The general data sources used for the study are listed in Section 5.0, Data Sources.



■ Shaded area shows extent of floodplain



Key Map

100 0 100 200 Miles



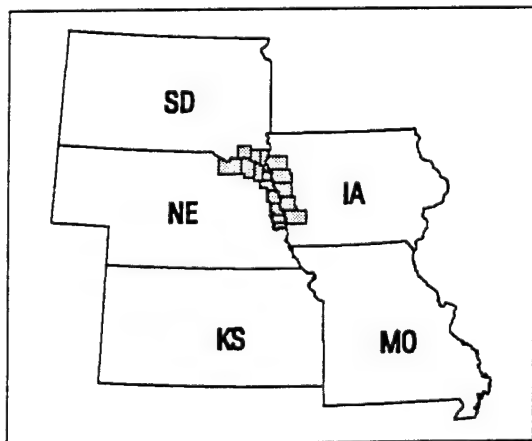
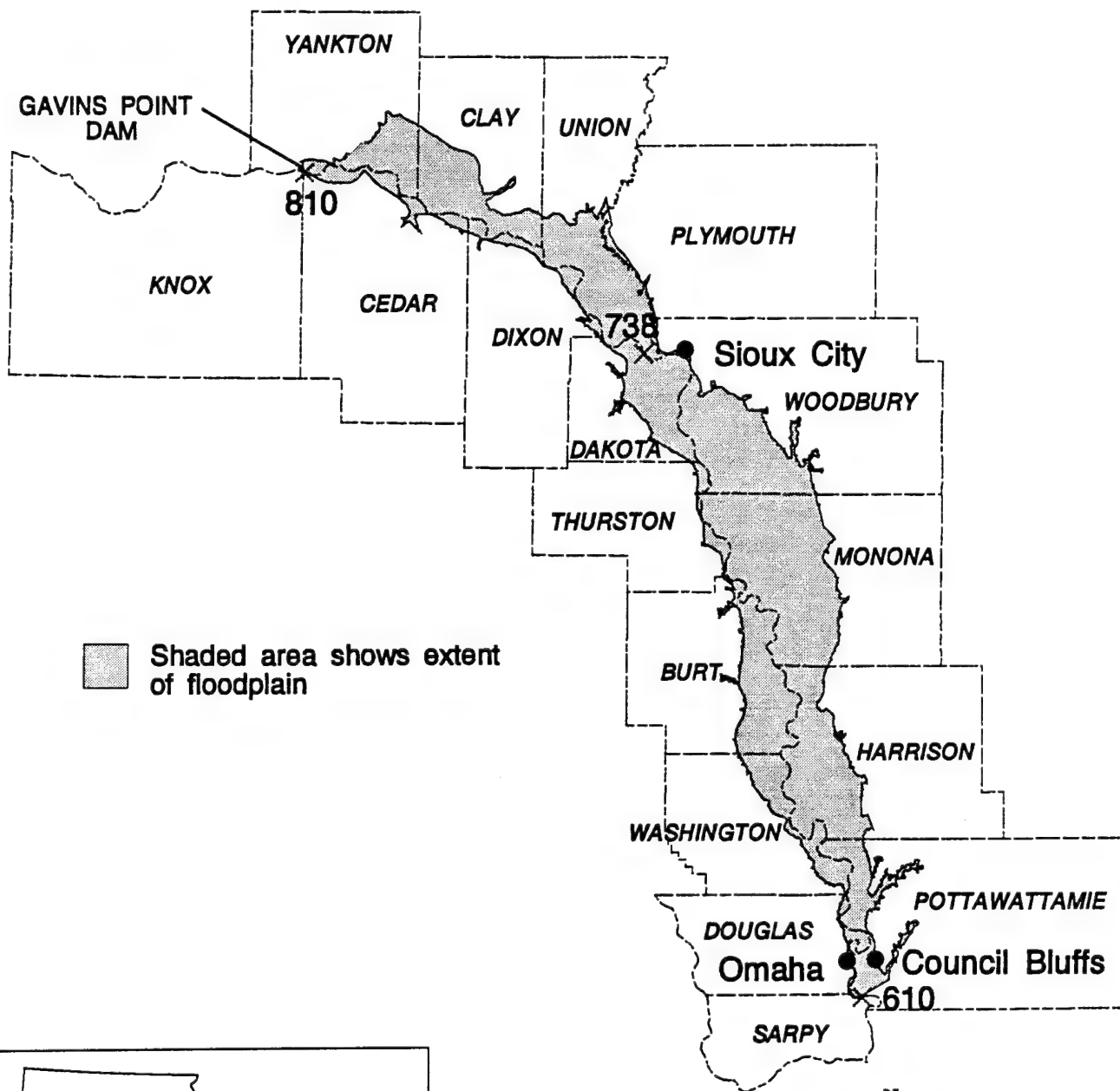
Figure 3-1
Lower Missouri River
Study Area

3.2 MISSOURI RIVER: GAVINS POINT DAM TO OMAHA, NEBRASKA

This study reach begins at Gavins Point Dam in Nebraska and ends near Omaha, Nebraska (see Figure 3-2). It is approximately 200 river miles in length. The reach adjoins three states, three counties in South Dakota, five counties in Iowa, and nine counties in Nebraska. Sioux City and Council Bluffs, Iowa and Omaha, Nebraska are the major communities along this reach. The James, Little Sioux, Big Sioux and Floyd Rivers are the primary tributaries entering the Missouri along this reach.

3.2.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.2-1. Descriptions of the state soil associations are provided in Appendix B.



Key Map

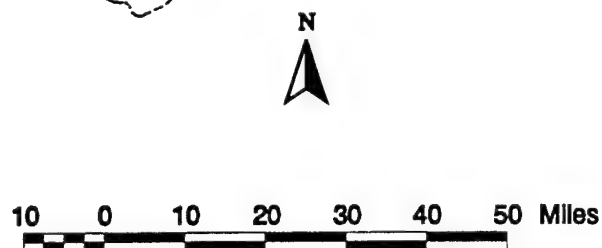


Figure 3-2
Missouri River:
Gavins Point Dam to
Omaha, Nebraska

Table 3.2-1

SOIL ASSOCIATIONS
MISSOURI RIVER: GAVINS POINT DAM - OMAHA

Soil Association	State	Occurrences	Acres	Percent
BALTIC-CHANCELLOR-LUTON	SD	1	51,060	5
ETHAN-CLARNO-BETTS	SD	5	2,120	<1
EGAN-WENTWORTH-ETHAN	SD	6	3,790	<1
CLARNO-BONILLA-TETONKA	SD	1	200	<1
HAYNIE-FORNEY-SARPY	SD	4	58,460	6
CLAMO-ETHAN-LAMO	SD	1	810	<1
SARPY-ONAWA-HAYNIE	NE	6	36,470	4
CROFTON-ALCESTER-NORA	NE	23	1,510	<1
LABU-SANSARC-BOYD	NE	1	70	<1
REDSTOE-GAVINS-LORETTO	NE	4	430	<1
AOWA-ALCESTER-KENNEBEC	NE	7	11,030	1
KENNEBEC-MCPAUL-NODAWAY	SD	1	6,900	<1
CROFTON-MOODY-ALCESTER	SD	1	390	<1
EGAN-WENTWORTH-WORTHING	SD	4	5,370	<1
LUTON-FORNEY-LAKEPORT	SD	4	38,980	4
KENNEBEC-MCPAUL-NODAWAY	IA	7	48,660	5
MODALE-ONAWA-BLENCOE	SD	2	25,520	3
GALVA-IDA-RADFORD	IA	1	10	<1
IDA-HAMBURG-NAPIER	IA	65	4,980	<1
IDA-MONONA-NAPIER	NE	27	460	<1
HAYNIE-GRABLE-ALBATON	SD	1	22,170	2
ALBATON-ONAWA-HAYNIE	IA	16	217,270	22
ALBATON-ONAWA-HAYNIE	SD	1	9,380	1
ALBATON-ONAWA-HAYNIE	NE	13	89,040	9
BLYBURG-BLENCOE-LUTON	NE	1	19,240	2
LUTON-FORNEY-SOLOMON	NE	2	74,030	8
MONONA-IDA-NAPIER	IA	31	2,690	<1
LUTON-SALIX-KEG	IA	3	185,690	19
KENNEBEC-WABASH-ZOOK	NE	2	340	<1
MONONA-IDA-JUDSON	NE	14	13,840	1
STEINAUER-PAWNEE-BURCHARD	NE	3	1,230	<1
ALBATON-ONAWA-HAYNIE	IA	3	32,700	3
KENNEBEC-MCPAUL-NODAWAY	IA	3	10,480	1
MONONA-IDA-NAPIER	IA	21	3,520	<1
LUTON-SALIX-KEG	IA	2	5,150	<1
ALBATON-ONAWA-HAYNIE	NE	2	910	<1
SOIL ASSOCIATIONS SUB TOTAL		289	984,900	100
UNCLASSIFIED AQUATIC	ALL	64	15,400	--
SOILS AND AQUATIC TOTAL		--	1,000,300	--

3.2.2 Land Use/Land Cover

3.2.2.1 Land Use

The total area covered by the floodplain in this reach is approximately 1,000,300 acres (Table 3.2-2). The floodplain is narrow below Gavins Point Dam, then widens substantially. In Monona County, Iowa the floodplain is 15 miles wide. A substantial increase in elevation occurs at the edge of the floodplain creating high bluffs. The river lies within the western portion of the floodplain for most of its length.

The two urban areas along this reach are Sioux City, Iowa and the Omaha-Council Bluffs metropolitan area. Numerous small communities occur along the reach. Railroad lines traverse the entire reach. Several major highways are within the floodplain.

Agriculture is the primary land use. An extensive levee system between Sioux City, Iowa and Omaha, Nebraska protects agricultural land from inundation. Corn, soybeans, and small grains are the main crops (SCS, 1993).

Table 3.2-2

LAND USE/LAND COVER¹
MISSOURI RIVER: GAVINS POINT DAM - OMAHA

Cover Type	Acres	Percent
Urban	60,040	6
Agriculture	869,390	87
Range	16,520	2
Upland Forest	310	< 1
Forested Wetland	5,470	< 1
Non-Forested Wetland	22,340	2
Water	25,840	3
Barren	390	< 1
Total	1,000,300	100

¹Extrapolated from 77 percent coverage.

3.2.2.2 Vegetation

Grassland occupies steep slopes and low lying areas of South Dakota agricultural land. Big and little bluestem, wheatgrass, indian grass, porcupinegrass, and needlegrass are the primary native species. Forested land is adjacent to the river throughout the reach, although more sporadically in the northern half. Patches of forest land occur on the bluffs consistently in Iowa, more sporadically in Nebraska.

Eastern cottonwood, American elm, honey locust, sycamore, boxelder, and black walnut are common tree species in the bottomlands. Basswood, red oak, uplands bur oak, and shagbark hickory grow on upland slopes (SCS, 1981).

3.2.2.3 Plant Species of Special Concern

No plant species of special concern were identified in the search of the Natural Heritage Inventory (NHI) database.

3.2.3 Aquatic Resources

3.2.3.1 Wetlands

Within this study reach, approximately 30,720 acres of vegetated wetland are in the adjacent floodplain. The majority is classified as emergent wetland (Table 3.2-3).

Table 3.2-3

AQUATIC RESOURCES MISSOURI RIVER: GAVINS POINT DAM - OMAHA

Wetland Class	Acres	Percent
Forested	5,470	18
Shrub/Scrub	5,610	18
Emergent	19,640	64
Water Resources	Acres	Number
Lakes & Ponds	6,980	239

North of Omaha, Nebraska, several wetland areas are found in association with state and Federally managed lands. The Tyson Island State Wildlife Management Area (SWMA) includes wetlands located between RM (RM) 656 and 653. The California Bend State Wildlife Refuge includes wetland areas between RM 651 and RM 649. Additional wetlands are present to the south of this area, along the right descending bank of the river. The DeSoto National Wildlife Refuge includes several wetland areas surrounding DeSoto Lake. The Nobles Lake SWMA also includes an area of emergent wetlands.

3.2.3.2 Lakes and Ponds

Approximately 239 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 6,980 acres. The average size of each pond or lake is approximately 29 acres.

Many of the lakes found in this study section are oxbow lakes; wetland areas are associated with many of these lakes. The following is a list of the largest lakes and their locations:

Lake	Location	River Mile
McCook Lake	W. of Sioux City, IA	740
Crystal Lake	S. of Sioux City, IA	735
Browns Lake	S. of Sioux City, IA	717
Badger Lake	N. of Onawa, IA	703
Blue Lake	W. of Onawa, IA	693
Round Lake	Mondamin, IA	664
DeSoto Lake	N. of Omaha, NE	643

West of Sioux City, Iowa, several wetland areas surround some oxbow lakes. These lakes include McCook Lake, Mud Lake, and Lake Goodenough. These areas contain both forested and emergent wetlands. Wetlands are also south of Sioux City near Crystal Lake.

Several wetland areas are also in the area of Browns Lake, which is an oxbow lake near Salix, Iowa. Browns Lake State Park is also near Salix. Several areas of emergent wetlands are near this lake and other oxbow lakes in this area. An area of forested wetlands is adjacent to the river at RM 715.

Several wetland areas are near Onawa, Iowa. The Badger Lake Wildlife Area includes several areas of emergent wetlands around Badger Lake. West of Onawa, wetland areas are near Blue Lake, other oxbow lakes and backwater lakes. Much of the area surrounding Blue Lake is included in Lewis and Clark State Park and the Blue Lake SWMA.

Near Mondamin, Iowa, an area of emergent wetlands surrounding Round Lake are included in the Round Lake Wildlife Management Area. Several other oxbow lakes and river backwaters in this area have associated wetlands.

3.2.3.3 Tributaries

Many tributaries empty into the Missouri River within this reach. Most of these tributaries are small perennial to intermittent streams. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
James River	E. of Yankton, SD	--
Vermillion River	Vermillion, SD	--
Big Sioux River	Sioux City, IA	734
Floyd River	Sioux City, IA	731
Little Sioux River	Little Sioux, IA	669
Soldier River	Mondamin, IA	664
Boyer River	Missouri Valley, IA	635

Several of the large wetlands areas in the upper section of this study area are associated with the confluence of major tributaries. This includes the confluences of the James River east of Yankton, Bow Creek between Yankton and Vermillion, and the Vermillion River south of Vermillion.

Several wetland areas are downstream of the confluence of the Little Sioux and Missouri Rivers. This area includes both forested and emergent wetlands. Portions of these wetlands are within the Deer Island and Three Rivers Wildlife Areas.

3.2.4 Fisheries

The Missouri River from Gavins Point Dam to Omaha, Nebraska provides important aquatic habitat for a variety of species. Major game species found in this reach of the Missouri River include channel catfish, crappie, and sauger (Konrad, 1994). Minor species include walleye, northern pike, largemouth bass, and flathead catfish. Species important to the commercial fishery include buffalo, carp, carpsucker, and freshwater drum (Boland and McCarthy, 1992). Due to decreased populations of catfish throughout this reach, commercial fishing for these species was closed in 1992 (Hesse, 1994).

Thirteen species of mussels are found in this reach. Major species include the giant floater and flat floater (Hesse, 1994). Minor species include the pink heel-splitter and the scaleshell. No commercial mussel harvest information was available for this reach.

3.2.4.1 Aquatic Species of Special Concern

The pallid sturgeon, lake sturgeon and blacknose shiner are the only protected aquatic species in this reach (Table 3.2-4). The pallid sturgeon is considered endangered Federally and by each state in the reach. The lake sturgeon is listed as threatened in Nebraska and South Dakota, and endangered in Iowa. The blacknose shiner is not Federally protected, but is listed as threatened in each of the states.

The pallid sturgeon occurs in 8 of the 17 counties in the reach. Two occurrences each of the pallid sturgeon were found in Woodbury County, Iowa and Yankton County, Nebraska. The blacknose shiner occurs only in Woodbury County, Iowa where it has been recorded at the mouth of the Floyd River. The lake sturgeon is known to occur in every county in Nebraska along this reach.

Table 3.2-4

**PROTECTED AQUATIC SPECIES OF THE MISSOURI RIVER
GAVINS POINT DAM - OMAHA**

Species	Federal Status	South Dakota Status	Nebraska Status	Iowa Status	Site Occurrences by County
Blacknose Shiner	--	T	T	T	Woodbury
Lake Sturgeon	--	T	T	E	All Nebraska Counties
Pallid Sturgeon	E	E	E	E	Douglas, Dakota, Dixon, Cedar, Clay, Woodbury(2), Washington, Yankton(2)

E = listed as endangered

T = listed as threatened

3.2.4.2 Important Aquatic Habitat

This reach contains one important tailwater, numerous areas where major tributaries flow into the Missouri and various side channels which provide important habitat for aquatic species. According to Hesse (1994), large numbers of paddlefish, blue sucker and buffalo, as well as most other native fishes accumulate in the tailwater of Gavins Point Dam each spring. The mouth of the James River provides important habitat for the pallid sturgeon and other species which migrate up the James to spawn in the spring. The Big Sioux and Floyd Rivers which flow into the Missouri near Sioux City, Iowa provide similar important habitat not only for the pallid sturgeon but also for the blacknose shiner. The DeSoto National Wildlife Refuge provides important habitat for the paddlefish and numerous other aquatic species.

3.2.5 Wildlife

The Missouri River bottoms provide a diversity of wildlife habitat for many species. Major species known to occur along this reach include white-tailed deer, wild turkey, ring-necked pheasant, cottontail rabbit and various furbearing mammals including beaver, raccoon, muskrat, and coyote. Oxbows and extensive wetlands scattered throughout this reach support thousands of waterfowl in the spring and fall of each year. Mallard, northern shoveler, blue-winged teal, and pintail are the major duck species known to occur along this reach. Canada and snow geese, as well as great blue herons and killdeer are also common throughout this reach. At the DeSoto National Wildlife Refuge in Iowa, it is not uncommon to observe over 400,000 snow geese using the area during peak migration (USFWS, 1988). The piping plover, interior least tern, and bald eagle are also known from throughout this reach.

3.2.5.1 Wildlife Species of Special Concern

Eight protected wildlife species are known to occur within this reach (Table 3.2-5). Three of these species are birds, two are mammals, one is an insect and two are reptiles. The piping plover, interior least tern, American burying beetle and bald eagle all have protective status under the Endangered Species Act. The remainder of the protected species are listed as endangered or threatened by at least

one of the states surrounding this reach. The river otter has been observed near Soldier Creek in Harrison County. The northern grasshopper mouse has been recorded near Whiting in Monona County, Iowa.

Table 3.2-5

**PROTECTED WILDLIFE SPECIES OF THE MISSOURI RIVER
GAVINS POINT DAM - OMAHA**

Species	Federal Status	South Dakota Status	Nebraska Status	Iowa Status	Site Occurrences by County
American Burying Beetle	E	--	T	--	Union
Bald Eagle	E	E	E	E	All counties
Eastern Hognose Snake	---	T	--	--	Clay, Union
False Mapturtle	--	T	--	--	Union, Clay, Yankton
Interior Least Tern	E	E	E	E	Harrison(2), Clay(19), Yankton(27), Union(13), Cedar(16), Dixon(20)
Northern Grasshopper Mouse	--	--	--	--	Monona
Piping Plover	T	--	T	E	Monona, Cedar(17), Pottawattamie(2), Woodbury(2), Harrison(2), Clay(14), Union(12), Yankton(24), Dixon(20)
River Otter	--	--	T	T	Harrison(2)

E = listed as endangered T = listed as threatened

3.2.5.2 Important Wildlife Habitat

Numerous oxbow lakes, wetlands, sandbars, riparian habitats and management areas throughout this reach provide important wildlife habitat. Sandbars in the upper part of this reach provide important habitat for piping plovers and interior least terns. The tailwaters of Gavins Point Dam provide important winter fishing habitat for bald eagles.

Omadi Bend Wildlife Area in Dakota County, Nebraska, the Decatur Bend Wildlife Area in Burt County, Nebraska, and the DeSoto National Wildlife Refuge in Pottawattamie County, Iowa provide important habitat for bald eagles, waterfowl and river otters.

Three rookeries are known to occur along this reach in Iowa, two are in Monona County and one is in Woodbury County. In Monona County, Iowa, a rookery in Lewis and Clark State Park contained two great egret nests in 1994. The second rookery in Monona County, near Louisville Bend, contained 15 cattle egret nests in 1994. The rookery in Woodbury County is near Snyder Bend; 40 nests were observed at this site in 1994 (Fleckenstein, 1994).

3.2.6 Fish and Wildlife Management Areas

This study reach contains 35 major fish and wildlife management areas (FWMAs); the majority are in Iowa. Federal wildlife refuges account for one of the 34 FWMAs; 24 areas are state-owned. Ownership of 10 areas was undetermined. Protected species known to exist in this study reach include the bald eagle, found within the Desoto National Wildlife Refuge. Presently under development is the Boyer Chute National Wildlife Refuge, which is east of Fort Calhoun in Washington County, Nebraska, near the Desoto National Wildlife Refuge. The 35 management areas are listed by state in Table 3.2-6; the acreage of each is also provided.

Table 3.2-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MISSOURI RIVER: GAVINS POINT DAM - OMAHA**

Management Areas	State	County	Type	Acres
Desoto National Wildlife Refuge	NE, IA	Washington, Harrison	F	7,823
Decatur Bend State Wildlife Mgmt. Area	NE	Burt	S	133
Omadi Bend State Wildlife Mgmt. Area	NE	Dakota	S	33
Basswood Ridge Wildlife Mgmt. Area	NE	Dakota	ND	360
Wiseman Wildlife Management Area	NE	Cedar	ND	365
Blackbird Marsh	IA	Pottawattamie	ND	14
Sioux Dam Wildlife Management Area	IA	Harrison	ND	10
Deer Island Wildlife Area	IA	Harrison	S	710
Three Rivers Wildlife Area	IA	Harrison	S	300
Gleason-Hubel Wildlife Area	IA	Harrison	ND	165
Soldier Bend Wildlife Area	IA	Harrison	S	279
Mondamin Wildlife Area	IA	Harrison	ND	38
Tyson Bend Wildlife Area	IA	Harrison	S	780
California Bend Wildlife Area	IA	Harrison	S	420
Sawmill Hollow Wildlife Area	IA	Harrison	ND	155
Missouri Dale Wildlife Area	IA	Harrison	ND	9
St. Johns Wildlife Area	IA	Harrison	S	87
Fish Lake Wildlife Area	IA	Harrison	ND	19
Nobles Lake Wildlife Area	IA	Harrison	S	232
Omaha Mission Bend	IA	Monona	S	120
Upper Monona Bend Wildlife Area	IA	Monona	ND	60
Badger Lake Wildlife Area	IA	Monona	S	987
Blackbird/Ivy Island Wildlife Area	IA	Monona	S	722
Blencoe Lake Wildlife Area	IA	Monona	S	70
Upper Blencoe Bend	IA	Monona	S	94
Louisville Bend Wildlife Area	IA	Monona	S	904
Loess Hills Wildlife Area	IA	Monona	S	2,742
Middle Decatur Bend	IA	Monona	S	338
Upper Decatur Bend	IA	Monona	S	534
Dakota Bend	IA	Woodbury	S	109
Mile Long Island	IA	Woodbury	S	230
Brown's Lake/IPS	IA	Woodbury	S	1,311
Lakeport Area	IA	Woodbury	S	120
Snyder-Winnebagi Bends	IA	Woodbury	S	2,865
Blue Lake State Wildlife Mgmt. Area	IA	Monona	S	865
Total Identified Acreage	—	—	—	24,003

Type: Federal (F), State (S), Local (L)

The Desoto National Wildlife Refuge, in both Nebraska and Iowa, is the largest refuge in this study reach. The refuge contains many natural features, including a scenic overlook, Bullhead Pond, Cottonwood Trail, Wood Duck Pond, Prairie Lane, and a 760-acre lake. Raccoons, coyotes, opossums, beaver, muskrat, turkeys, pheasant, red-headed woodpeckers, songbirds, and mink are wildlife that inhabit this refuge. Bald eagles are often seen in the trees, and several thousand migrating snow and blue geese rest and feed throughout the area. Common activities include fishing, boating, hiking, hunting, and mushroom gathering (USFWS, 1994).

Omadi Bend SWMA, south of Dakota City near U.S. Highway 77 in Dakota County, contains a three-acre oxbow lake. The management area is adjacent to the Omadi Bend State Recreation Area. Hunting for pheasant, quail, and dove is common.

Located north of the town of Turin in Monona County, Loess Hills Wildlife Area is situated within upland, timber, and prairie. Hunting for quail, deer, pheasant, turkey, and squirrel is popular, as well as pond fishing. Snyder-Winnebago Bends, operated by the Iowa Department of Natural Resources (DNR) in Woodbury County, is within timber, marsh, and uplands. Waterfowl, pheasant, and deer are commonly hunted.

Harrison County, Iowa contains 13 management areas, the largest number of FWMAs of all the counties within this study reach. Three of the larger wildlife areas are Deer Island Wildlife Area, Tyson Bend Wildlife Area, and California Bend Wildlife Area. Deer Island Wildlife Area is in the northwest portion of the county, with fishing and hunting activities available. Wildlife inhabiting the Tyson Bend area include waterfowl, squirrel, woodcock, and deer. California Bend, in the southwest corner of the county, is used for hunting of deer, waterfowl, and pheasant.

Louisville Bend Wildlife Area, Badger Lake Wildlife Area, and Blackbird/Ivy Island Wildlife Area are a few of the larger management areas within Monona County. The Louisville Bend area, southwest of Onawa, is situated within marshlands and timber and provides opportunities for hunting. The Badger Lake Wildlife Area, situated west of Whiting, contains marsh and upland, with hunting opportunities available. Found west of Onawa, Blackbird/Ivy Island Wildlife Area also provides hunting for waterfowl, squirrel, and deer.

Since the flood of 1993, the U.S. Army Corps of Engineers (USCOE) has acquired some lands along the Missouri River as wildlife mitigation sites. The evaluation of potential sites is currently ongoing.

3.2.7 Natural Areas

Three natural areas, totalling over 1,000 acres, are listed for this reach. Areas are listed by county, ownership, and acreage in Table 3.2-7.

Table 3.2-7
NATURAL AREAS
MISSOURI RIVER: GAVINS POINT DAM - OMAHA

Natural Areas	State	County	Type	Acres
Neale Woods Nature Center	NE	Washington Douglas	ND	300
Mount Talbot	IA	Woodbury Plymouth	S	90
Adams Natural Area	SD	Union	S	628
Total Identified Acreage	--	--	--	1,018

Type: Federal (F), State (S), Private (P) **ND** = No Data

Neale Woods Nature Center north of Omaha features deciduous forest on bluff hills along the river and a 27-acre reseeded prairie. The site is maintained as a nature center and is listed on the Nebraska Natural Areas Register (Steinauer, 1994).

Mount Talbot is within Stone State Park near Sioux City, Iowa. The park borders the study reach. The preserve area of the park is loess hills. This landform is the result of a large silt load from the Great Plains which was carried by the Missouri River during the last ice age. Erosion has shaped the loess into a steep landscape. The valleys are wooded predominantly in burr oak. Ridgetop prairies feature little and big bluestem, sideoats gramma, and Indian grass. The plant community supports a diverse community of butterflies. Rare plants are also in the area (Fleckenstein, 1992).

South Dakota has one recently dedicated natural area. Adams Natural Area south of Vermillion is a large bottomland forest dominated by old growth cottonwoods. The area also features Mud Lake. Hiking trails allow observation of waterfowl, wildlife, and wildflowers (South Dakota Game, Fish and Parks Department, 1994).

3.2.8 Recreation Areas

This study reach contains 18 major recreation areas; the majority are in Iowa. One Federal recreation area, the Missouri River Federal Access Area, is found within this study reach. A portion of the Missouri is also designated as the Missouri River National Recreation River. State parks and forests account for ten of the 18 recreation areas; the remaining seven recreation areas are locally-owned. Camping, hunting/fishing, and water activities were the most commonly available recreational opportunities along this study reach. Picnicking and hiking/biking were less common. The 18 recreation areas and the activities which they provide are listed in Table 3.2-8.

Table 3.2-8

RECREATION AREAS
MISSOURI RIVER: GAVINS POINT DAM - OMAHA

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Dodge Park	NE	Douglas	445	L	--	--	X	--	X*
Fort Atkinson State Historical Park	NE	Washington	148	S	--	--	--	--	--
Pelican Point State Recreation Area	NE	Burt	36	S	X	X	X	X	X*
Beck Memorial Park	NE	Burt	ND	L	--	--	X	--	X*
Missouri River Federal Access Area	NE	Thurston	ND	F	X	--	X	--	--
Omadi Bend State Recreation Area	NE	Dakota	ND	S	ND	ND	ND	ND	ND
Ponca State Park	NE	Dixon	830	S	X	X	X	--	X*
Gavins Point Dam and Lewis & Clark Lake	NE	Cedar	ND	L	X	--	X	--	X*
Lake Manawa State Park	IA	Pottawattamie	1,529	S	X	--	X	X	X*
Wilson Island Recreation Area	IA	Pottawattamie	577	S	X	--	X	X	X*
Little Sioux Delta Park	IA	Harrison	15	L	X	X	X	--	X*
Loess Hills Pioneer State Forest	IA	Harrison	3,472	S	--	--	X	--	--
Round Lake	IA	Harrison	477	S	--	--	X	--	X*
Lewis & Clark State Park	IA	Monona	176	S	--	--	X	X	X
Stone State Park	IA	Woodbury	1,069	S	X	--	X	X	X
Browns Lake - Bigelow Park	IA	Woodbury	24	L	X	X	X	X	X*
Snyder Bend Park	IA	Woodbury	35	L	X	X	X	--	X*
Clay County Lakeside Use Area	SD	Clay	ND	L	ND	ND	ND	ND	ND
Total Identified Acreage	--	--	8,833	--	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

The Missouri River Federal Access Area, in Thurston County, Nebraska, is a long access area used for camping and fishing. Located north of Ponca in Dixon County, Ponca State Park provides a boat access, camping and picnic facilities, trail rides, and swimming and boating areas. Fishing and hunting are also available.

Fort Atkinson State Historic Park, south of Fort Calhoun in Washington County, was the first U.S. fort west of the Missouri River (Sportsman's Atlas Co., 1994). The Pelican Point State Recreation Area, northeast of Tekamah in Burt County, provides opportunities for camping, picnicking, and boating. Fishing for buffalo, channel and flathead catfish, carp, drum, walleye, and sauger and, hunting of quail, rabbit, and waterfowl are popular activities.

The Loess Hills Pioneer State Forest, in Harrison County, Iowa, is an upland and timber area with hunting of deer, squirrel, pheasant, and turkey available. The state forest is the largest recreation area within this study reach.

Lake Manawa State Park, the largest state park within this study reach, is southwest of Council Bluffs in Pottawattamie County, Iowa. Recreational opportunities include camping, swimming, biking, fishing, and boating on the 660-acre natural lake.

Situated in the northwest corner of Woodbury County in Iowa, Stone State Park contains a 12-acre man-made lake and, nature, bridle, and hiking trails. Camping, fishing, and snowmobiling are available. Wilson Island Recreation Area, next to Wilson Island State Park, is in the northwest corner of Pottawattamie County, Iowa. Camping, hiking, fishing, and hunting are common. Lewis and Clark State Park, west of Onawa in Monona County, offers hiking, fishing, and swimming facilities. The park also includes a 250-acre natural lake.

3.2.9 Data Gaps

The land use/land cover data only covered 77 percent of the study area. It did not include the upper portion of the reach. The data was extrapolated proportionately to provide an estimate for the total area.

3.2.10 References Cited

Boland, T. and McCarthy, T. 1992. *Mississippi and Missouri Rivers Commercial Fishing Report*. Iowa Department of Natural Resources. Des Moines, IA.

Fleckenstein, J. 1992. *Iowa State Preserves Guide*. Iowa Department of Natural Resources. Des Moines, IA.

Fleckenstein, J. 1994. *Correspondence*. Iowa Department of Natural Resources. Des Moines, IA.

Hesse, L.W. 1994. *Flora and Fauna of the Missouri River Downstream from the Fort Randall Dam to the Mouth as they Relate to the Alteration of the Hydrosystem*. Nebraska Game and Parks Commission. Norfolk, NE.

Konrad, M. 1994. *Correspondence*. Iowa Department of Natural Resources. Des Moines, IA.

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

Soil Conservation Service. 1993. *Natural Vegetation of South Dakota*. National Cartography and GIS Center. Fort Worth, TX.

South Dakota Game, Fish and Parks. 1994. *Park Times: Guide to Year-Round Fun in South Dakota's State Parks*. Sioux Falls, SD.

Sportsman's Atlas Co. 1994. *Nebraska Sportsman's Atlas*. Lytton, IA.

Steinauer, G. 1994. *Telephone Conversation*. Nebraska Game and Parks Commission.

U.S. Fish and Wildlife Service. 1988. *Desoto National Wildlife Refuge*. Concept Plan. Missouri Valley, IA.

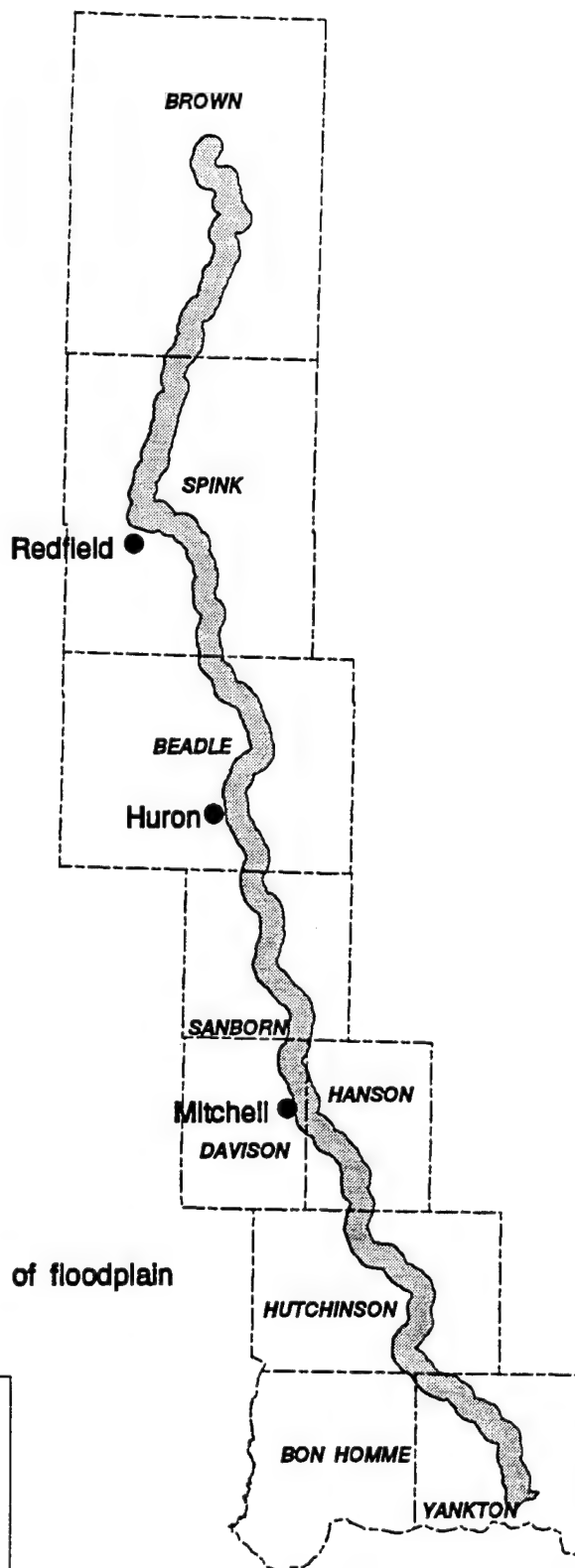
U.S. Fish and Wildlife Service. 1994. *Desoto National Wildlife Refuge*. Missouri Valley, IA.

3.3 JAMES RIVER

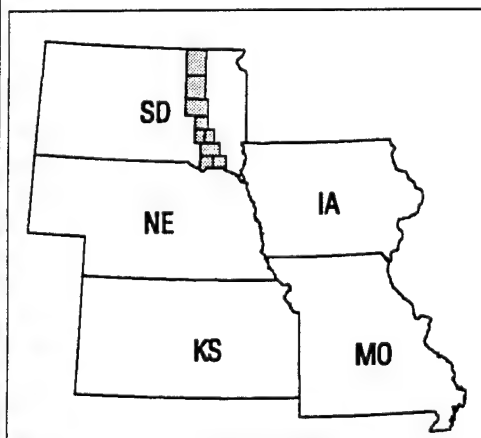
This study reach is the portion of the James River beginning near Columbia in Brown County, South Dakota and ending at the confluence with the Missouri River in Yankton County, South Dakota (see Figure 3-3). The reach adjoins nine counties. It is approximately 205 river miles in length. Huron and Mitchell, South Dakota are the major communities along this reach. The Elm, Mud and Wolf Rivers are the primary tributaries entering the James River along this reach.

3.3.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.3-1. Descriptions of the state soil associations are provided in Appendix B.



Shaded area shows extent of floodplain



Key Map



Figure 3-3
James River

Table 3.3-1

**SOIL ASSOCIATIONS
JAMES RIVER**

Soil Type	State	Occurrences	Acres	Percent
BEARDEN-GREAT BEND-OVERLY	SD	15	97,120	18
GARDENA-ECKMAN-GLYNDON	SD	2	1,280	<1
ABERDEEN-HARMONY-BEOTIA	SD	12	30,100	6
LUDDEN-LAMOURE-LADELLE	SD	1	31,790	6
LUDDEN-RYAN-LADELLE	SD	1	580	<1
LAMOURE-LUDDEN-LOWE	SD	1	23,660	4
ABERDEEN-NAHON-EXLINE	SD	1	3,510	1
BEADLE-DUDLEY-BON	SD	5	25,270	5
CLAMO-LAMO-DAVIS	SD	1	25,360	5
HOUDEK-PROSPER-TETONKA	SD	9	23,460	4
CARTHAGE-ENET-BLENDON	SD	1	210	<1
CARTHAGE-FORESTBURG-SHUE	SD	6	13,870	3
CLARNO-PROSPER-TETONKA	SD	4	33,970	6
HAND-BONILLA-DUDLEY	SD	1	50	<1
CLARNO-ETHAN-PROSPER	SD	1	6,100	1
CLAMO-ETHAN-LAMO	SD	3	115,290	22
CARTHAGE-HAND-CLARNO	SD	4	5,730	1
FORESTBURG-SHUE-DAVISON	SD	2	5,900	1
HAND-CLARNO-ETHAN	SD	12	20,050	4
HOUDEK-DUDLEY-STICKNEY	SD	5	2,140	<1
CLARNO-PROSPER-STICKNEY	SD	3	6,640	1
BLENDON-HENKIN-HAND	SD	1	3,210	1
CLARNO-BONILLA-TETONKA	SD	24	37,360	7
CLARNO-ETHAN-BONILLA	SD	6	9,820	2
BON-ETHAN-DAVIS	SD	2	1,840	<1
ETHAN-CLARNO-BETTS	SD	1	750	<1
EGAN-WENTWORTH-ETHAN	SD	2	2,880	1
SOIL ASSOCIATIONS SUB TOTAL	--	126	527,940	100
UNCLASSIFIED AQUATIC	SD	2	1,010	--
SOILS AND AQUATIC TOTAL	--	--	528,550	--

3.3.2 Land Use/Land Cover

3.3.2.1 Land Use

The James River is a narrow meandering river within a floodplain of consistent width. Small bluffs define the edge of the floodplain. The reach is entirely rural. Yankton, Mitchell and Huron, South Dakota are the larger towns along the river. No quantitative land cover data was available for this reach.

The James River lies in an area of primarily farmland. About one-third of the agricultural land is rangeland. The majority of the cropland in this area is dry-farmed. Cash crops include spring wheat, soybeans, potatoes, sugar beets, and corn (SCS, 1993).

3.3.2.2 Vegetation

Tall and mid-grass prairies are native. Western wheatgrass, big and little bluestem, porcupine grass, and green needlegrass are native species (SCS, 1993).

Sparse patches of woodland are widely scattered along the river. Burr oak, American basswood, American elm, eastern cottonwood, green ash, and willows are the major bottomland tree species (SCS, 1981).

3.3.2.3 Plant Species of Special Concern

The only protected plant species known to occur along this reach is the Federally-threatened western prairie fringed orchid (Table 3.3-2a). It has been identified in Brown, Hanson, Hutchinson and Yankton Counties, South Dakota (South Dakota NHI, 1994).

Table 3.3-2a

**PROTECTED PLANT SPECIES
JAMES RIVER**

Species	Federal Status	South Dakota Status	Site Occurences by County
Western Prairie Fringed Orchid	T	T	Brown, Hanson, Hutchinson, Yankton

3.3.3 Aquatic Resources

3.3.3.1 Wetlands

Along the James River within this study reach, approximately 37,070 acres of vegetated wetland are in the adjacent floodplain. They are almost exclusively emergent wetlands (Table 3.3-3). The vegetated wetlands appear to be evenly distributed along the river segment. Many wetland areas are associated with oxbow lakes which are found throughout this reach.

Table 3.3-3

**AQUATIC RESOURCES
JAMES RIVER**

Wetland Class	Acres	Percent
Forested	2,290	6
Shrub/Scrub	90	< 1
Emergent	34,690	94
Water Resources	Acres	Number
Lakes & Ponds	1,580	97

A large area of wetlands extends from Columbia to the northern end of the Columbia Reservoir. Areas of emergent wetlands in this six-mile section provide important habitat for waterfowl and shore birds. This area borders the Columbia Game Protection Area.

3.3.3.2 Lakes and Ponds

Approximately 97 individual lakes and ponds are located within the river segment. The total surface area of these lakes and ponds is approximately 1,580 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is only 16 acres.

3.3.3.3 Tributaries

Several tributaries empty into the James River. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Wolf Creek	W. of Freeman, SD
Twelvemile Creek	S. of Mitchell, SD
Enemy Creek	S. of Mitchell, SD
Firesteel Creek	Mitchell, SD
Sand Creek	S. of Huron, SD
Mud Creek	S. of Aberdeen, SD
Elm Creek	N. of Aberdeen, SD

Southeast of Mitchell, a large wetland area is present where Enemy Creek and Johnson Creek join the river. East of Mitchell, wetlands are at the confluence of Rock Creek and farther downstream along the James River. North of Mitchell, wetlands are present along a five-mile stretch of the James River directly east of Letcher.

Southeast of Aberdeen, Stratford Slough is an important wetland area at the confluence of Moccasin Creek. This 800-acre area of emergent wetlands provides excellent waterfowl habitat and a colonial bird rookery is also present in this area.

3.3.4 Fisheries

This reach of the James River contains six important tributaries, numerous wetlands and several low-head dams, all important to aquatic species. Forty-four species of fish have been reported to occur in this reach of the James River (Kannowski, 1979). Major game species known to occur in this reach include walleye, northern pike, yellow perch, and black bullhead. Other common species include carp, buffalo, bluegill, and crappie. The lower James River, with its connection to the Missouri River, provides more aquatic habitat than most upstream reaches. The numerous low-head dams along the James River provide long pools of deepwater habitat that are important during low-flow. These low-head dams also create nutrient traps and prevent some species from migrating upstream during periods of low flows.

3.3.4.1 Aquatic Species of Special Concern

Two protected aquatic species occur in this reach of the James River (Table 3.3-4). The pallid sturgeon has Federal protection. The plains topminnow has been observed in Sanborn County, near Forestburg and in Hutchinson County, South of Olivet. The Pallid sturgeon has been observed near the Mouth of the James River.

Table 3.3-4

PROTECTED AQUATIC SPECIES JAMES RIVER

Species	Federal Status	South Dakota Status	Site Occurrences by County
Pallid Sturgeon	E	E	Yankton
Plains Topminnow	--	T	Hutchison, Sanborn

E = listed as endangered

T = listed as threatened

3.3.4.2 Important Aquatic Habitat

The K.O. Lee Dam in Brown County and the Rockport Dam in Hanson County provide important deepwater habitat for a variety of aquatic species including walleye and catfish. Stratford Slough in Brown County provides important spawning habitat for northern pike and panfish. Most importantly, the mouth of the James River provides important habitat for species found in the Missouri and James Rivers. Many species use the James River as a spawning and rearing area and move back into the Missouri River as adults (Kannowski, 1979).

3.3.5 Wildlife

Riparian habitat along the James River provides important habitat for 21 species of mammals, 11 species of reptiles and 87 species of birds (Kannowski, 1979). The James River also provides an effective north-south corridor through South Dakota for migrating birds.

The James River lies within the Prairie Pothole Region and is used extensively by waterfowl. Fourteen species of waterfowl are known to nest in this area. According to Kannowski (1979), between 31,000 and 350,000 ducks and about 150,000 Canada geese migrate through this area annually. Major species of ducks known to occur in this area include mallard, wood duck, blue-winged teal, lesser scaup, and ring-necked duck. Major upland game bird species include ring-necked pheasant, gray partridge, mourning dove, and bobwhite quail. Minor species include the sharp-tailed grouse and the greater prairie chicken.

Major species of mammals known to occur along this reach include white-tailed deer, red fox, coyote, muskrat, eastern cottontail rabbit, and fox squirrel. Minor species include pronghorn, mule deer, white-tailed jackrabbit, and gray squirrel. Although mule deer have been harvested throughout this reach, they are not as common as white-tailed deer. Pronghorn are more common in northern South Dakota but are rarely seen in this reach of the James River.

3.3.5.1 Wildlife Species of Special Concern

The only protected wildlife species known to occur along this reach are the whooping crane and bald eagle (Table 3.3-5). Both have Federal and state protection. The whooping crane has been observed just north of Huron in Beadle County, South Dakota. The bald eagle has been observed near the Columbia Road Reservoir in Brown County.

Table 3.3-5

PROTECTED WILDLIFE SPECIES JAMES RIVER

Species	Federal Status	South Dakota Status	Site Occurrences by County
Bald Eagle	E	E	Brown
Whooping Crane	E	E	Beadle

E = listed as endangered

T = listed as threatened

3.3.5.2 Important Wildlife Habitat

The James River provides important habitat for many species of wildlife. Vandel (1986) identified 26 areas of significant wildlife habitat on the James River in South Dakota. Twenty-four of these areas are included in this reach. Houtcooper (1986) identified eight significant ecological areas along the James. All eight of these areas are included in this reach.

The Columbia area of the James River, below Columbia Road Reservoir in Brown County, consists of riparian timber with emergent marsh vegetation important to waterfowl as a nesting and migrating area. At Stratford Slough in Brown County, the river widens and forms a large semi-permanent wetland with considerable emergent vegetation. A rookery containing five species of colonial nesting birds is in the center of this area. Houtcooper (1986) identified Stratford Slough as the best large wetland system along the James River in South Dakota. Gallup Woods near Gallup in Spink County provides important habitat for white-tailed deer, pheasant, and other species. The area near Sand

Creek in Sanborn County provides important habitat for white-tailed deer and other wildlife. This area is home to the only mule deer herd known from Sanborn County (Vandel, 1986). Goat Island in Yankton County is a state natural area and may be of regional or national significance (Houtcooper, 1986). Goat Island is a large riverine island with native vegetation that provides important habitat for white-tailed deer, ring-necked pheasants, and other species. Numerous wetlands along the James River provide important habitat for migrating whooping cranes.

3.3.6 Fish and Wildlife Management Areas

This study reach contains three major FWMAs, in two counties. The three state-owned FWMAs comprise approximately 800 acres of land and water, ranging in size from 40 acres to 600 acres. The three management areas are listed by state in Table 3.3-6; the acreage of each is also provided.

Table 3.3-6

FISH AND WILDLIFE MANAGEMENT AREAS JAMES RIVER

Management Areas	State	County	Type	Acres
Mission Hill Game Production Area	SD	Yankton	S	600
Kelley's Cove Refuge	SD	Yankton	S	160
Columbia State Management Area	SD	Brown	S	40
Total Identified Acreage	--	--	--	800

Type: Federal (F), State (S), Local (L) ND = No Data

Mission Hill Game Production Area is the largest management area (600 acres) within this study reach. Located two miles north and three miles east of Yankton in Yankton County, the production area serves as habitat for the Federally-endangered bald eagle. northeast of Yankton is Kelley's Cove Refuge. Fishermen use the area around the refuge as an access to fish.

The 40-acre Columbia State Management Area, upstream from Columbia in Brown County, is a timber and marshlands area and provides a wintering area for deer. The Columbia area serves as habitat for waterfowl breeding and spawning sites for fish.

3.3.7 Natural Areas

Two designated natural areas were identified on the James River. Information on these areas is provided in Table 3.3-7.

Table 3.3-7

**NATURAL AREAS
JAMES RIVER**

Natural Areas	State	County	Type	Acres
Stratford Slough	SD	Brown	P	771
Goat Island	SD	Yankton	F	ND
Total Identified Acreage	--	--	--	771

Type: Federal (F), State (S), Private (P) ND = No Data

Stratford Slough in Brown County is a semi-permanent wetland area. The Moccasin Creek enters the James River there. Houtcooper (1986) describes this area as the best of the larger wetland ecosystems along the river. Emergent vegetation found here provides excellent waterfowl brood habitat. The area is also an important spawning area and a rookery for five colonial species. Shoreline flora provide cover for pheasant and deer. Goat Island is at the confluence of the James and Mississippi Rivers. This large riverine island is Federally owned and managed by the National Park Service (Houtcooper, 1986; Vandel, 1986)

3.3.8 Recreation Areas

This study reach contains four major recreation areas, two of which are state-owned. No Federal recreation areas occur within this study reach. The recreation areas comprise over 800 acres of land and water. The four recreation areas and the activities which they provide are listed in Table 3.3-8.

Table 3.3-8

**RECREATION AREAS
JAMES RIVER**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Lake Byron Lakeside Use Area	SD	Beadle	ND	S	X	--	--	--	X*
Foster Grove State Park	SD	Spink	277	S	X	X	X	X	X
Armada Park	SD	Spink	160	L	ND	ND	ND	ND	ND
Tacoma Park	SD	Brown	400	L	ND	ND	ND	ND	ND
Total Identified Acreage	--	--	837	--	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Fisher Grove State Park, site of an historic site, is the only state park within this study reach. North of Huron in Spink County, the park provides camping, picnicking, fishing, playground, boating/canoeing, and hiking facilities.

The Lake Byron Lakeside Use Area is a state-owned area northeast of Huron in Beadle County. Camping and boat access opportunities are available.

3.3.9 Data Gaps

No land use data was available for this reach. Descriptions were based on a review of maps and an SCS Agricultural Handbook (SCS, 1993).

3.3.10 References Cited

Houtcooper, W.C. 1986. *Preliminary Terrestrial Vertebrate Survey*. James River, South Dakota.

Kannowski, P.B. 1979. *Fish and Wildlife Resources*. Technical Paper, James River Basin, North and South Dakota. Res. Rep. 29. University of North Dakota. Grand Forks, ND.

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

Soil Conservation Service. 1993. *Natural Vegetation of South Dakota*. National Cartography and GIS Center. Fort Worth, TX.

South Dakota Natural Heritage Inventory. 1994. *Database Search*. Department of Game, Fish and Parks. Pierre, SD.

Vandel, G. 1986. *Significant Wildlife Habitat. Report to the South Dakota Department of Water and Natural Resources*. Rep. No. 86-9. Pierre, SD.

3.4 LITTLE SIOUX RIVER

This study reach begins in Dickinson County and flows through eight counties in Iowa (see Figure 3-4). It ends at the confluence of the Little Sioux with the Missouri River floodplain in Monona County. It is approximately 153 river miles in length. Spencer, Sioux Rapids and Cherokee, Iowa are the major communities along this reach.

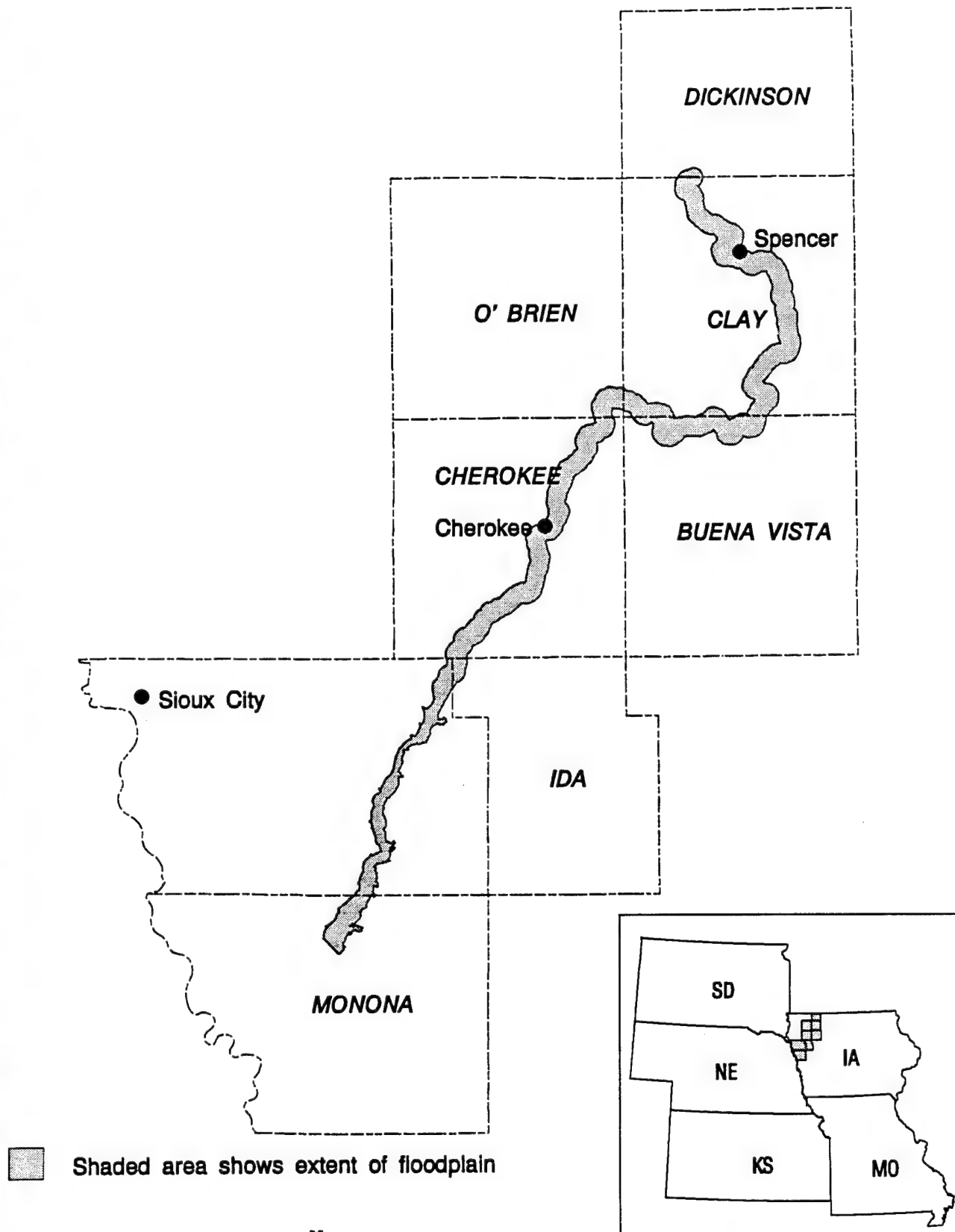
3.4.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.4-1. Descriptions of the state soil associations are provided in Appendix B.

Table 3.4-1

SOIL ASSOCIATIONS LITTLE SIOUX RIVER

Soil Association	State	Occurrences	Acres	Percent
EVERLY-WILMONTON-LETRI	IA	10	5,700	4
WADENA-HARCOT-BISCAY	IA	6	13,240	9
COLO-CALCO-KENNEBEC	IA	1	56,460	37
MARNA-GUCKEEN-KILKENNY	IA	6	1,340	< 1
BOLAN-OCHEYEDAN-DICKMAN	IA	2	820	< 1
PRIMGHAR-MARCUS-GALVA	IA	11	4,300	3
CLARION-STORDEN-NICOLLET	IA	7	12,530	8
COLAND-WADENA-HAVELOCK	IA	2	1,460	< 1
CLARION-NICOLLET-WEBSTER	IA	10	2,510	2
STEINAUER-STORDEN-GALVA	IA	13	22,730	15
SAC-GALVA-PRIMGHAR	IA	13	2,420	2
GALVA-PRIMGHAR-SAC	IA	22	3,370	2
KENNEBEC-MCPAUL-NODAWAY	IA	1	21,370	14
MONONA-IDA-NAPIER	IA	14	1,460	< 1
IDA-HAMBURG-NAPIER	IA	9	1,260	< 1
SOIL ASSOCIATIONS SUB TOTAL		127	150,970	100
UNCLASSIFIED AQUATIC	IA	--	--	--
SOILS AND AQUATIC TOTAL		--	150,970	--



Key Map

Figure 3-4
Little Sioux River

3.4.2 Land Use/Land Cover

3.4.2.1 Land Use

The total area of floodplain covered by this reach is 150,970 acres (Table 3.4-2). The floodplain is approximately one mile wide for most of the reach, which is entirely rural. Cherokee and Spencer, Iowa are the two largest towns along the reach. The major land use along the Little Sioux River is agriculture, mainly cropland. Raising beef cattle and hogs are also important farm enterprises.

Table 3.4-2

LAND USE/LAND COVER LITTLE SIOUX RIVER

Cover Type	Acres	Percent
Urban	7,710	5
Agriculture	122,920	81
Range	6,450	5
Upland Forest	3,400	2
Wetland*	6,350	4
Water	4,140	3
Barren	0	--
Total	150,970	100

*No NWI data available for forested wetland.

3.4.2.2 Vegetation

The native grassland vegetation includes big bluestem, Indian grass, and switchgrass. Sparse narrow bands of forest land are all along the river. Scattered forest patches are also on the higher floodplain edges. Eastern cottonwood, American elm, honey locust, sycamore, and black walnut are common species on the bottomlands. On higher ground basswood, red oak, white oak, and shagbark hickory are commonly found.

3.4.2.3 Plant Species of Special Concern

Two protected plant species are found in this reach (Table 3.4-2a). Neither of these species have federal protection under the Endangered Species Act of 1973. Water parsnip has been reported from both Clay and Cherokee Counties. The eastern oriental lomatium has been observed near Quimby, Iowa.

Table 3.4.2a

**PROTECTED PLANT SPECIES
LITTLE SIOUX RIVER**

Species	Federal Status	Iowa Status	Site Occurrences by County
Eastern Oriental Lomatium	--	T	Cherokee
Water Parsnip	--	T	Clay, Cher

E = listed as endangered

T = listed as threatened

3.4.3 Aquatic Resources

3.4.3.1 Wetlands

No NWI data was available for this study reach. However, wetlands were identified within this study reach by reviewing USGS topographic maps (1:250,000). Based on the land use/land cover data, approximately 6,350 acres of vegetated wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Very few islands are within the channel of the Little Sioux River. Therefore, most of the wetlands are adjacent to the main river channel or along some of the larger tributaries, lakes, or ponds. For the most part, wetlands exist as small isolated pockets. This is primarily due to the large amount of agricultural land within the Little Sioux River floodplain.

3.4.3.2 Lakes and Ponds

Approximately 69 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 500 acres. These water bodies are relatively small in size. The average size of each pond or lake is approximately 7 acres.

Wetland areas associated with several small ponds and oxbow lakes are in southern Woodbury County. Several wetland areas are southeast of Spencer, Iowa. These wetlands are associated with several small ponds that are in the Hawk Valley recreation area.

3.4.3.3 Tributaries

Several tributaries empty into the Little Sioux River within this particular segment. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Maple River	E. of Onawa, IA
Mill Creek	N. of Cherokee, IA
Ocheyedan River	Spencer, IA

Several areas of wooded and emergent wetlands are at the confluence of the Little Sioux and Missouri Rivers. Several oxbow lakes near the confluence have associated wetland areas. The Deer Island State Game Management Area is directly upstream from this confluence.

3.4.4 Fisheries

Major species that occur in the Little Sioux River include channel and flathead catfish, bluegill, carpsuckers, carp and drum. Minor species include smallmouth bass, largemouth bass, and walleye (Harrig, 1994).

3.4.4.1 Aquatic Species of Special Concern

The Natural Heritage data search did not identify any aquatic species of special concern in the Little Sioux River.

3.4.4.2 Important Aquatic Habitat

The Little Sioux River north of Smithland, Iowa contains a greater diversity of habitat than does the lower part of the Little Sioux River (Harrig, 1994). The Sioux Dam near Little Sioux, Iowa provides an important concentration area for fish. The Linn Grove Dam which is about a ten-foot structure also provides an important concentration area for fish. The confluence of the Little Sioux with the Missouri River is an important area for many fish species.

3.4.5 Wildlife

Major wildlife species known to occur in this reach include white-tailed deer, ring-necked pheasant, and numerous species of furbearers including coyote, raccoon, and red fox. River otter are occasionally seen north of Smithland. Common waterfowl species known to occur along this reach include mallard, wood duck, northern shoveler, green-winged teal, blue-winged teal, and Canada and snow geese. Bald eagles are also found throughout this reach.

3.4.5.1 Wildlife Species of Special Concern

The bald eagle is the only wildlife species of special concern occurring in this reach (Table 3.4-5). It is considered endangered by the Federal government and all the states along the reach.

Table 3.4-5

PROTECTED WILDLIFE SPECIES LITTLE SIOUX RIVER

Species	Federal Status	Iowa Status	Nebraska Status	Missouri Status	Site Occurences by County
Bald Eagle	E	E	E	E	All counties

3.4.5.2 Important Wildlife Habitat

The lower Little Sioux River below Smithland has been channelized and straightened, resulting in poor quality wildlife habitat. Above Smithland, the riparian corridor along the Little Sioux provides

important habitat for bald eagles, pheasants, and other species. The Linn Grove Dam near Linn Grove provides an important concentration area for fish, attracting both bald eagles and river otter (Neal, 1994). Wooded areas along the Little Sioux River also provide important nesting habitat for wild turkeys and bobwhite quail.

3.4.6 Fish and Wildlife Management Areas

This study reach contains 13 major FWMAs, the majority are in Clay County. SWMAs account for seven of the management areas; the ownership of the remaining six is undetermined. No Federal management areas are within this study reach. The 13 management areas are listed by state in Table 3.4-6; the acreage of each is also provided.

Table 3.4-6

FISH AND WILDLIFE MANAGEMENT AREAS LITTLE SIOUX RIVER

Management Areas	State	County	Type	Acres
Carter Timber	IA	Woodbury	ND	90
Sioux Bend Wildlife Area	IA	Woodbury	S	64
Harold Clark Habitat Area	IA	Cherokee	ND	33
Redtail Ridge Habitat Area	IA	Cherokee	ND	215
Waterman Prairie	IA	O'Brien	S	532
Burr Oak Wildlife Area	IA	Buena Vista	ND	40
Burr Area	IA	Clay	S	9
Fen Valley	IA	Clay	S	160
Little Sioux Wildlife Area	IA	Clay	S	213
Stouffer Memorial Wildlife Preserve	IA	Clay	ND	21
Hawk Valley	IA	Clay	S	330
Bob Howe/Thunder Bridge Wildlife Refuge	IA	Clay	ND	34
Reiter Wildlife Area	IA	Clay	S	54
Total Identified Acreage	--	--	--	1,795

Type: Federal (F), State (S), Local (L)

ND = No Data

Waterman Prairie, in the southeast corner of O'Brien County, is the largest management area within this study area. The area is situated within uplands and woodlands, and provides hunting and fishing opportunities.

The Hawk Valley area, east of Spencer in Clay County, offers hunting, fishing, and hiking opportunities. Sioux Bend Wildlife Area is west of Correctville in Woodbury County. Fishing and hunting of deer and pheasant are common activities. The Reiter Wildlife Area, near Spencer in Clay County, also offers pheasant and deer hunting.

North of Gillett Grove in Clay County, the Little Sioux Wildlife Area provides hunting of squirrel, turkey, and deer. Comprised of native prairie and fens, the Fen Valley area is managed by the Iowa Department of Natural Resources. Hunting of pheasant is allowed within the Fen Valley area. Redtail Ridge Habitat Area, south of Cherokee in Cherokee County, provides hiking, cross-country skiing, fishing, and hunting opportunities.

3.4.7 Natural Areas

No natural areas were identified along the Little Sioux River.

3.4.8 Recreation Areas

This study reach contains 15 major recreation areas, the largest of which is the 379-acre Shagbark Hills area. All of the recreational areas within this study reach are local. No known state parks or Federal recreation areas occur within this study reach. Camping, picnicking, hunting/fishing, and water activities were the most commonly available recreation opportunities along this study reach. Hiking/biking activities were less common. The 15 recreation areas and the activities which they provide are listed in Table 3.4-8.

Table 3.4-8

**RECREATION AREAS
LITTLE SIOUX RIVER**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Rodney Pits Recreation Area	IA	Monona	45	L	--	X	X	--	X*
Little Sioux Park	IA	Woodbury	375	L	X	X	X	X	X*
Shagbark Hills	IA	Woodbury	379	L	--	--	X	--	--
Little Sioux River Greenbelt	IA	Woodbury	25	L	--	--	X	--	--
Washta Access	IA	Ida	52	L	--	X	X	--	X*
Ranney Knob Area	IA	Cherokee	86	L	X	X	X	--	X*
Stieneke Area	IA	Cherokee	16	L	X	X	X	--	X*
Little Sioux Greenbelt	IA	Cherokee	5	L	--	--	X	--	--
Silver Sioux Recreation Area	IA	Cherokee	160	L	X	X	X	--	X*
Martin Area	IA	Cherokee	223	L	X	X	X	X	X*
Linn Grove Dam Area	IA	Buena Vista	12	L	X	X	X	--	X*
Grabielson Park	IA	Buena Vista	36	L	--	X	X	--	X
Buena Vista County Conservation Park	IA	Buena Vista	308	L	X	X	--	X	--
Kindlespire Little Sioux Access	IA	Clay	222	L	X	X	X	X	X*
Oneota Little Sioux Access	IA	Clay	154	L	X	X	X	X	X*
Total Identified Acreage	--	--	2,098						

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Little Sioux Park, northwest of Anthony in Woodbury County, contains a 10-acre lake and many recreational opportunities, including camping, picnicking, swimming, hiking, fishing, boating, and winter sports. The facilities consist of a baseball field, shooting range, and an historic site.

West of Linn Grove in Buena Vista County, Buena Vista County Conservation Park provides camping, picnicking, hiking, and winter sports. The site also includes an arboretum, native grass, and wildflower planting (Sportsman's Atlas Co., 1994).

Prairie and forest comprise the Martin Area, which is north of Cherokee. Camping, fishing, boating, snowmobiling, cross-country skiing, hiking, picnicking, horseback riding, and hunting are the main recreational opportunities available at the Martin Area. Boat and canoe access, baseball diamonds, and winter sports facilities are also available.

Northeast of Quimby is the Silver Sioux Recreation Area, providing camping, fishing, hunting, cross-country skiing, and winter sports opportunities. The site is within wooded hillsides and prairie and allows canoe access.

3.4.9 Data Gaps

The boundaries for the floodplain for the Little Sioux River do not extend from bluff to bluff, because this area had not been mapped by SAST. In lieu of such boundary, a buffer of approximately one mile on either side of the river was provided by the USCOE.

3.4.10 References Cited

Harrig, D. 1994. *Telephone Conversation*. Iowa Department. of Natural Resources. Des Moines, IA.

Neal, T. 1994. *Telephone Conversation*. Iowa Department. of Natural Resources. Des Moines, IA.

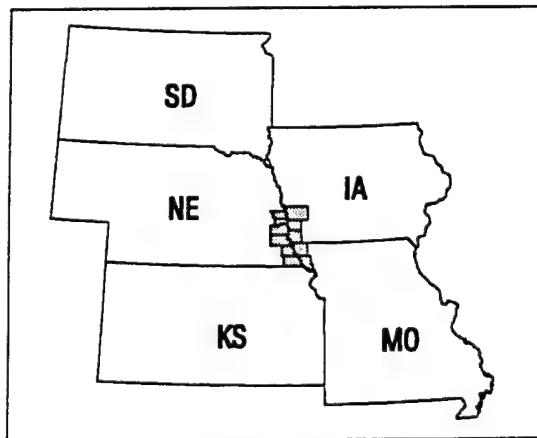
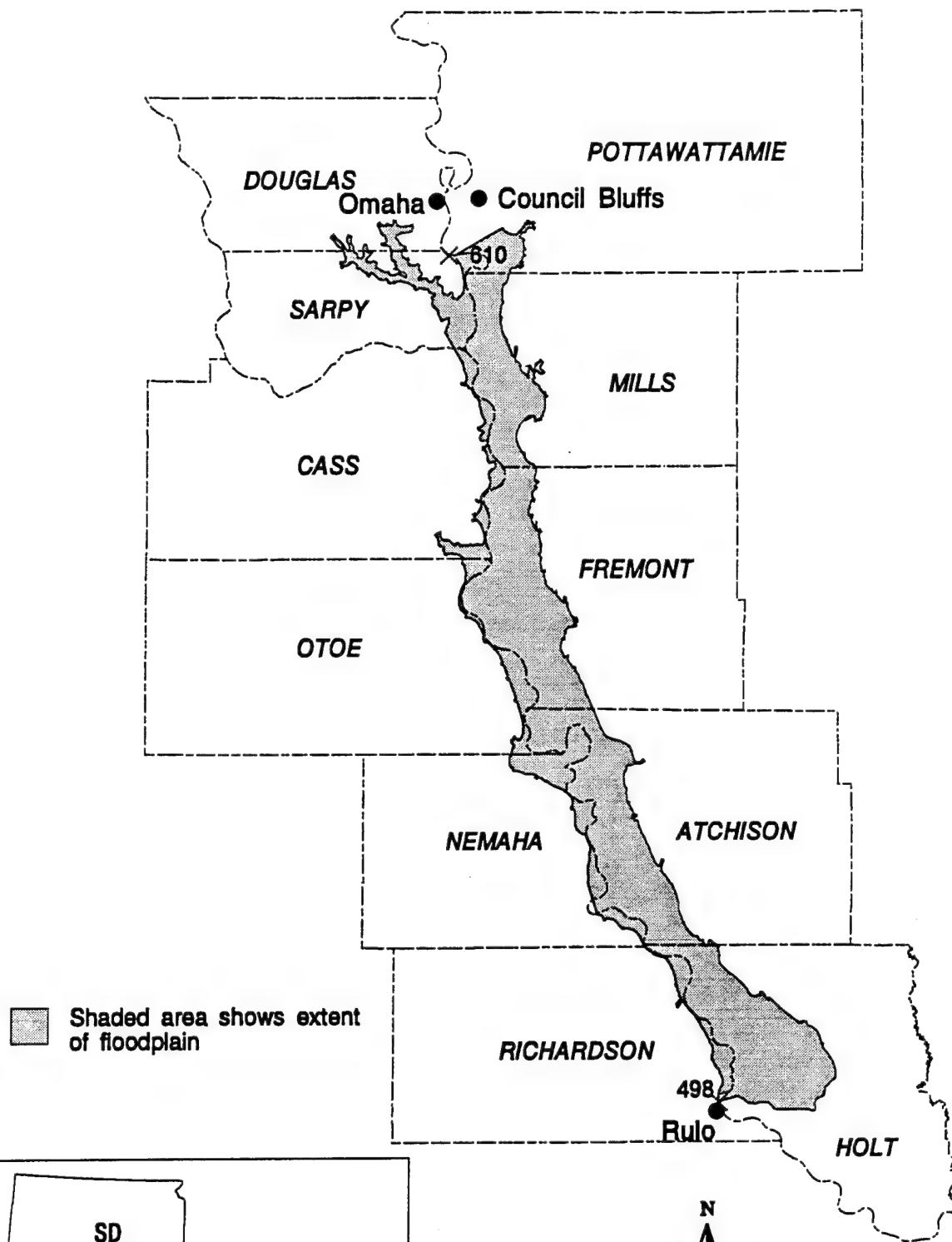
Sportsman's Atlas Co. 1994. *Iowa Sportsman's Atlas*. Lytton, IA.

3.5 MISSOURI RIVER: OMAHA TO RULO, NEBRASKA

This study reach begins near Omaha, Nebraska (RM 610), and ends at Rulo, Nebraska (RM 498, see Figure 3-5). Nebraska City and the south end of Omaha, Nebraska are the major communities along this reach. The reach is approximately 112 river miles in length; adjoining three states, three counties in Iowa, two counties in Missouri, and six counties in Nebraska. The Nishnabotna, Little Nemaha, and Platte Rivers are primary tributaries entering the Missouri along this reach.

3.5.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.5-1. Descriptions of the state soil associations are provided in Appendix B.



Key Map

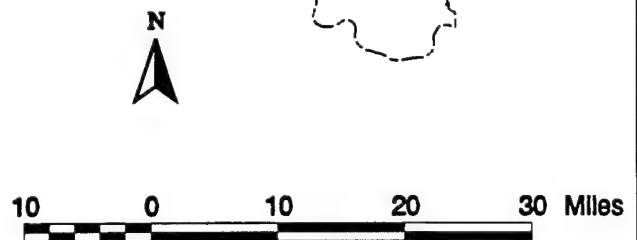


Figure 3-5
Missouri River:
Omaha to Rulo, Nebraska

Table 3.5-1

**SOIL ASSOCIATIONS
MISSOURI RIVER: OMAHA - RULO**

Soil Association	State	Occurrences	Acres	Percent
MARSHALL-PONCA-JUDSON	NE	10	15,620	4
KENNEBEC-MCPAUL-NODAWAY	IA	2	22,600	6
MONONA-IDA-NAPIER	IA	6	820	< 1
LUTON-SALIX-KEG	IA	2	50,060	14
ALBATON-ONAWA-HAYNIE	IA	6	53,280	15
IDA-HAMBURG-NAPIER	IA	28	2,430	< 1
ALBATON-ONAWA-HAYNIE	NE	25	44,460	13
INVALE-CASS-BARNEY	NE	2	1,500	< 1
MONONA-IDA-JUDSON	NE	13	620	< 1
IDA-MONONA-NAPIER	NE	15	2,680	< 1
KENNEBEC-WABASH-ZOOK	NE	3	2,290	< 1
SHARPSBURG-PAWNEE-JUDSON	NE	2	160	< 1
PAWNEE-BURCHARD-WYMORE	NE	2	990	< 1
ALBATON-ONAWA-HAYNIE	MO	2	41,990	12
LUTON-SALIX-KEG	MO	1	85,450	25
KENNEBEC-MCPAUL-NODAWAY	MO	1	22,260	6
MONONA-IDA-NAPIER	MO	21	800	< 1
NODAWAY-COLO-ZOOK	MO	2	200	< 1
SOIL ASSOCIATIONS SUB TOTAL	--	143	348,210	100
UNCLASSIFIED AQUATIC	ALL	21	23,330	--
SOILS AND AQUATIC TOTAL	--	--	371,540	--

3.5.2 Land Use/Land Cover

3.5.2.1 Land Use

The total area of the floodplain within this reach is 371,540 acres (Table 3.5-2). The floodplain ranges from three miles in width at the Mills-Fremont County line to almost 10 miles in width at Rulo, Nebraska. The floodplain extends further on the left descending bank of the river than on the

right descending bank. A railroad line and a stretch of Interstate 29 traverse the middle of the floodplain. The Council Bluffs-Omaha metropolitan area is the largest urban area within the reach. Nebraska City is the only other sizable town within the reach. Offutt Air Force Base is just south of Omaha, Nebraska.

Table 3.5-2

**LAND USE/LAND COVER
MISSOURI RIVER: OMAHA - RULO**

Cover Type	Acres	Percent
Urban	18,920	5
Agriculture	316,150	85
Range	2,700	1
Upland Forest	330	< 1
Wetland*	21,900	6
Water	11,300	3
Barren	240	< 1
Total	371,540	100

*No NWI data available for forested wetland.

The wide floodplain is used primarily for agriculture; corn, soybeans, and hay are the principal crops. Levees along almost the entire length of the river protect agricultural land.

3.5.2.2 Vegetation

This area originally supported true prairie vegetation. Big and little bluestem, Indian grass, switch grass, porcupinegrass, and green needlegrass were once the native species (SCS, 1981).

Forest land within this reach is immediately adjacent to the river and on the numerous islands formed by the braided river channels. Tree species in the bottomlands include cottonwood, American elm, honey locust, sycamore, and black walnut. Basswood, red and bur oak, and shagbark hickory grow on upland slopes (SCS, 1981).

3.5.2.3 Plant Species of Special Concern

Four Missouri endangered species are within this reach (Table 3.5-2a). None of the species have Federal status. Three of these species are in Holt County. Blue lettuce has been found in three locations in Atchison County, Missouri.

Table 3.5-2a

**PROTECTED PLANT SPECIES OF THE MISSOURI RIVER
OMAHA - RULO**

Species	Federal Status	Iowa Status	Nebraska Status	Missouri Status	Site Occurrences by County
Blue Lettuce	--	--	--	E	Atchison (3)
Creeping Love Grass	--	--	--	E	Holt
Green False Foxglove	--	--	--	E	Holt
Lake-Bank Sedge	--	--	--	E	Holt

E = listed as endangered T = listed as threatened

3.5.3 Aquatic Resources

3.5.3.1 Wetlands

Very limited NWI data was available for this study reach. Therefore, wetlands were identified by reviewing USGS topographic maps.

Based on the land use/land cover data, approximately 21,900 acres of vegetated wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Many of the wetland areas are associated with small oxbow lakes and ponds that are found throughout this reach.

Several other wetland areas are east and southeast of Nebraska City, Nebraska. These wetlands surround small ponds, oxbow lakes, and streams. Frazers Island and Schemmel Island also have several wetland areas on both sides of the river. These wetlands are mainly between RM 559 and RM 555.

East of Rulo, Nebraska areas of both emergent and wooded wetlands are present at the north end of Big Lake. Farther east of Rulo, a large area of wetlands is included in the Squaw Creek National Wildlife Refuge.

Several wetland areas are at the confluence of the Missouri and Nishnabotna Rivers. Wetlands are along both of these rivers, as well as along Greys Lake and several other small ponds and oxbow lakes in the area. Greys Lake is a long section of abandoned creek channel. Several wetland areas are north of Rulo, Nebraska. An island along the left descending bank of the Missouri River between RM 513 and RM 510 has several areas of forested and emergent wetlands. Near RM 508, several wetland areas are located within the Thurnau State Wildlife Area. Other wetlands in this reach are at the confluence of the Missouri and Tarkio Rivers. Wetlands also surround several small ponds and creek channels in the area.

A significant wetland complex with associated ponds is near Harvey at the confluence of the Des Moines River and English Creek, just below the dam on Lake Red Rock.

3.5.3.2 Lakes and Ponds

Approximately 77 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 1,910 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is approximately 25 acres.

Many of these water bodies are oxbow lakes that were once part of either the Missouri River or one of the smaller tributaries entering the river. Following is a list of the largest lakes and their locations:

Lake	Location	River Mile
Lake Manawa	S. of Council Bluffs, IA	607
Folsom Lake	S. of Council Bluffs, IA	597
Forneys Lake	S. of Council Bluffs, IA	577
Greys Lake	S. of Hamburg, IA	545
Big Lake	E. of Rulo, NE	500

Northeast of Nebraska City, Nebraska an area of emergent wetlands is near Forneys Lake. This lake is along the left descending bank. These wetland areas are included in the Forneys Lake State Game Management Area.

3.5.3.3 Tributaries

Several tributaries empty into the Missouri River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger water ways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
Platte River	S. of Omaha, NE	595
Nishnabotna River	S. of Hamburg, IA	542
Little Nemaha River	S.W. of Rockport, MO	528
Tarkio River	N. of Rulo, NE	508

3.5.4 Fisheries

The Missouri River from Omaha to Rulo, Nebraska supports a diversity of aquatic species. Major species of sport fish include channel catfish, flathead catfish, white and largemouth bass, and various species of panfish. Minor species of sport fish known to occur in this reach include walleye, sauger, and northern pike. Species important to the commercial fishery include carp, buffalo, and freshwater drum (Bassett, 1991). As a result of decreased populations, commercial fishing for catfish was closed in 1992 (USCOE, 1993).

This reach of the Missouri River is known to receive heavy recreational use throughout the year. Fishing has been identified as the top recreational activity in the southern portion of this reach (Bassett, 1991).

3.5.4.1 Aquatic Species of Special Concern

The pallid and lake sturgeons are the only two protected aquatic species known to occur in this reach (Table 3.5-4). The pallid sturgeon is Federally endangered and listed as endangered by Iowa, Nebraska and Missouri. The lake sturgeon is not Federally endangered or threatened but is listed as endangered in Iowa and Missouri and threatened in Nebraska.

Table 3.5-4

PROTECTED AQUATIC SPECIES OF THE MISSOURI RIVER OMAHA - RULO

Species	Federal Status	Iowa Status	Nebraska Status	Missouri Status	Site Occurrences by County
Lake Sturgeon	--	E	T	E	Sarpy, Nemaha
Pallid Sturgeon	E	E	E	E	Sarpy(2), Cass(2), Nemaha(2), Otoe

E = listed as endangered T = listed as threatened

3.5.4.2 Important Aquatic Habitat

Numerous side channels, freshwater marshes, oxbow lakes, tributaries, and dike pools scattered throughout this reach provide important habitat for aquatic species. The mouths of the Platte, Little Nemaha, Nemaha, Tarkio, and Nishnabotna Rivers provide important feeding and spawning areas for pallid and lake sturgeons. These tributaries also provide important nursery areas for other fish species. Dike pools scattered throughout this reach provide valuable resting, spawning and rearing habitat for many species (USCOE, 1993). The rock faces of revetments also provide important habitat for a wide range of species.

3.5.5 Wildlife

Sandbars, islands, wetlands, abandoned channels and oxbow lakes all provide important habitat for least terns, piping plover and other wildlife species. The Missouri River and its associated wetlands are known to support approximately 61 species of shorebirds, waterbirds, and wading birds (Johnsgard, 1980). Common shorebirds and wading birds include great blue heron, great egret, killdeer, and various species of sandpipers. Major mammal species include beaver, mink, muskrat, white-tailed deer, and coyote. Common game birds known to occur along this reach include wild turkey, pheasant, bobwhite quail, mourning dove, and various species of waterfowl. Major waterfowl species found in this reach include mallard, wood duck, northern shoveler, and pintail. Bald eagles are also known to occur from throughout this reach.

3.5.5.1 Wildlife Species of Special Concern

Sixteen protected species are known to occur along this reach (Table 3.5-5). Eleven of these species are birds, three are reptiles, one is an amphibian, and one is a mammal. The bald eagle, peregrine falcon, interior least tern, and piping plover are the only species with Federal protection under the Endangered Species Act. The remainder of the protected species known to occur along this reach are listed as rare, threatened or endangered by Missouri, Iowa and/or Nebraska. Holt County, Missouri contains the highest number of protected species in this reach.

Table 3.5-5

**PROTECTED WILDLIFE SPECIES OF THE MISSOURI RIVER
OMAHA TO RULO**

Species	Federal Status	Iowa Status	Nebraska Status	Missouri Status	Site Occurrences by County
American Bittern	--	--	--	E	Holt
Bald Eagle	E	E	E	E	Freemont, Atchison, Holt
Black-Crowned Night Heron	--	--	--	R	Holt
Blanding's Turtle	--	--	--	E	Holt
Burrowing Owl	--	--	--	--	Fremont
Common Moorhen	--	--	--	R	Holt
Double-Crested Cormorant	--	--	--	--	Fremont
Interior Least Tern	E	E	E	--	Cass(2), Pottawattamie(2), Fremont
Northern Leopard Frog	--	--	--	R	Atchison
Peregrine Falcon	E	--	E	--	Sarpy(2), Nemaha, Cass
Pied-Billed Grebe	--	--	--	R	Holt
Piping Plover	T	E	T	--	Pottawattamie(2), Cass(2)
River Otter	--	T	E	--	Pottawattamie
Western Massasauga	--	--	--	E	Holt(2)
Western Fox Snake	--	--	--	E	Atchison
Yellow-Headed Blackbird	--	--	--	R	Holt(3), Atchison

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

3.5.5.2 Important Wildlife Habitat

Numerous state and Federal management areas throughout this reach provide important habitat for many wildlife species. At over 7,000 acres, Squaw Creek National Wildlife Refuge in Holt County, Missouri provides important habitat for yellow-headed black birds, American bitterns, common moorhens, pied billed grebes, western massasauga rattlesnakes, bald eagles, and numerous species of waterfowl. The mouths of the Nishnabotna River, Tarkio River, Platte River, and both Little and Big

Nemaha Rivers provide important habitat for bald eagles, interior least terns, and piping plovers. The McKissick Bottoms Area in Atchison County, Missouri provides important habitat for the leopard frog and various species of waterfowl. Opps Lake, also in Atchison County, provides important night roosting habitat for bald eagles (Kramer, 1993). Big Lake State Park in Holt County, Missouri is known to contain important habitat for the yellow-headed blackbird. A great blue heron rookery near the James A. McCormack Wildlife Area contained 62 nests in 1992 (Kramer, 1993).

3.5.6 Fish and Wildlife Management Areas

This study reach contains 21 major FWMAs, located in Nebraska, Missouri, and Iowa. Five Federal wildlife refuges, are in this study reach; 13 areas are state-owned. The ownership of three is undetermined. Protected species include the Federally-endangered bald eagle and peregrine falcon; both can be found within the Squaw Creek National Wildlife Refuge. The 21 management areas are listed by state in Table 3.5-6; the acreage of each is also provided.

Four of the sites were acquired by the USCOE after the flood of 1993 for wildlife habitat mitigation. They are: Hamburg Bend, Langdon Bend, Kansas Bend, and Tobacco Island. The sites contain a total of approximately 1,550 acres.

Table 3.5-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MISSOURI RIVER: OMAHA - RULO**

Management Areas	State	County	Type	Acres
Rake's Creek State Wildlife Mgmt. Area	NE	Cass	S	316
Randall Schilling State Wildlife Mgmt. Area	NE	Cass	S	1,465
Plattsmouth State Wildlife Management Area	NE	Sarpy	S	ND
Hamburg Bend	NE	Otoe	F	100
Langdon Bend	NE	Nemaha	F	200
Kansas Bend	NE	Nemaha	F	250
Tobacco Island	NE	Cass	F	1,000
Jamerson C. McCormack Wildlife Area	MO	Holt	S	227
Squaw Creek National Wildlife Refuge	MO	Holt	F	6,900
H.F. Thurnau Wildlife Area	MO	Holt	S	366
Star School Hill Prairie Conservation Area	MO	Atchison	S	129
Brickyard Hill Conservation Area	MO	Atchison	S	2,262
Forneys Lake State Game Management Area	IA	Fremont	S	1,071
Copeland Bend	IA	Fremont	ND	469
I-29 Borrow Areas: Percival Wildlife Area	IA	Fremont	S	80
McPaul Wildlife Area	IA	Fremont	S	166
Green Hollow Wildlife Area	IA	Fremont	S	341
Scott Wildlife Area	IA	Fremont	S	80
PJ Wildlife Area	IA	Mills	S	34
West Oak Forest	IA	Mills	ND	308
Folsom Wildlife Area	IA	Mills	S	100
Total Identified Acreage	--	--	--	15,864

Type: Federal (F), State (S), Local (L)

ND = No Data

The Squaw Creek National Wildlife Refuge, southwest of Mound City in Holt County, Missouri, is the largest FWMA in the study reach; a portion of its land and water are within this study reach. Established in 1935, the refuge provides habitat for many different species, including the red bat, woodchuck, beaver, plains pocket gopher, and gray and red fox. The Squaw Creek area contains four large lakes within marshlands and provides observation towers, foot trails, and opportunities for

fishing and hunting. The site is often visited by hundreds of wintering bald eagles and many migrating geese and ducks. Over 367 different species of birds, mammals, and reptiles and amphibians are found within this refuge (USFWS, 1992).

Randall Schilling SWMA, north of Plattsmouth in Cass County, contains carp, catfish, crappie, bluegill, and bullhead in its ponds and rivers. Although no boating is allowed on the lake, hunting of waterfowl is permitted.

Northeast of Rockport, Brickyard Hill Conservation Area provides hunting, fishing, camping, boating, and hiking opportunities. Wildlife inhabiting the area include deer, turkey, and waterfowl. A 20-acre lake is within the wildlife area.

Green Hollow Wildlife Area is found within grassland, timber, and upland. Located north of Thurman, the Green Hollow area offers hunting of squirrel, deer, and turkey. H.F. Thurman Wildlife Area, west of Craig in Holt County, provides boat access and offers hunting, fishing, camping, and hiking opportunities. McPaul Wildlife Area, northwest of Thurman, consists of small lakes within uplands. Hunting of waterfowl and pheasant is common.

3.5.7 Natural Areas

Seven designated natural areas were identified in this study reach. Natural areas account for over 2,200 acres. They contain diverse features including tallgrass prairie, wet prairie, loess bluff prairies, freshwater marsh and bottomland forest. The Fontenelle Forest is a national natural landmark (Steinauer, 1994). The areas, their location, ownership and acreage are provided in Table 3.5-7.

Table 3.5-7

NATURAL AREAS MISSOURI RIVER: OMAHA - RULO

Natural Areas	State	County	Type	Acres
Fontenelle Forest Nature Center	NE	Sarpy	P	1,500
Nishnabotna Bottom Prairie	MO	Atchison	ND	20
Big Lake State Park (Freshwater Marsh)	MO	Holt	S	147
Bluejoint-Sloughgrass Research Natural Area	MO	Holt	ND	250
McCormack Loess Mounds Natural Area	MO	Holt	S/P	112
Thurnau Conservation Area	MO	Holt	ND	225
Browning Bottom Prairie	MO	Holt	ND	9
Total Identified Acreage	--	--	--	2,263

Type: Federal (F), State (S), Private (P) ND = No Data

The Fontenelle Forest Nature Center in Bellevue features high bluffs dominated by oak-hickory eastern mixed deciduous forest. The area is considered a national natural landmark. The floodplain

forest is predominantly cottonwood and sycamore. The national forest contains about 20 acres of tallgrass prairie. The area is maintained as a natural preserve and is used for nature study and hiking (Steinauer, 1994). It is the only natural area in the Nebraska portion of this reach.

Six areas were identified in Missouri. The Nishnabotna Bottom Prairie is a wet prairie that is surrounded by cropland. Both a state-endangered plant and a state watch list butterfly occurs on the site. Big Lake State Park contains a freshwater marsh that is listed as a significant natural area. The marsh contains cattail, bulrush, water-plaintain, and smartweed as dominants. State-endangered plants and a state-rare animal occur on the site. Bluejoint-Sloughgrass Research Natural Area is a wet prairie and wetlands area with Squaw Creek National Wildlife. Research in the area includes bird species surveys in wetland communities. A nearby 3,000-acre marsh serves as significant migratory waterfowl habitat. A state-endangered amphibian, two reptiles and a plant occur in the area.

McCormack Loess Mounds Natural Area is a portion of the Jamerson C. McCormack Wildlife Area. The area is south of the Squaw Creek NWR and features rugged loess mounds vegetated by prairie and forest. Plant species here are common to the Great Plains but are unusual Missouri flora. Two endangered plants occur in this area which is jointly owned by Nature Conservancy and Missouri Department of Conservation. Thurnau Conservation Area is a wet bottomland forest. The area is significant because it is one of the few remaining bottomland forests in the region; cottonwood is a dominant species in the forest. Browning Bottom Prairie is a wet prairie of moderate diversity. A state-endangered plant occurs at the site (Kramer, 1993; Thom and Iffrig, 1985).

No natural areas are listed for Iowa (Fleckenstein, 1992).

3.5.8 Recreation Areas

This study reach contains 12 major recreation areas; seven are in Iowa. State parks and recreation areas account for eight of the 12 recreation areas; the remaining four recreation areas are locally-owned. No Federal recreation areas occur within this study reach. Camping, picnicking, hunting/fishing, and water activities were the most commonly available recreation opportunities along this study reach. Hiking/biking activities were less common. The 12 recreation areas and the activities which they provide are listed in Table 3.5-8.

Table 3.5-8

**RECREATION AREAS
MISSOURI RIVER: OMAHA - RULO**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Indian Cave State Park	NE	Richardson, Nemaha	2,831	S	X	X	X	--	X*
Brownville State Recreation Area	NE	Nemaha	22	S	X	X	X	--	X*
Riverview Marina State Recreation Area	NE	Otoe	37	S	X	--	X	--	X*
Haworth Park	NE	Sarpy	ND	L	--	--	X	--	X*
Big Lake State Park	MO	Holt	407	S	X	X	X	--	X*
Waubonsie State Park	IA	Fremont	1,247	S	X	X	--	X	--
Forney Lake	IA	Fremont	1,128	S	--	--	X	--	--
Key Lake	IA	Mills	104	S	--	--	X	--	--
Mile Hill Lake	IA	Mills	39	L	--	--	X	--	--
Pony Creek Park	IA	Mills	53	L	X	X	X	X	--
Lake Marawa State Park	IA	Pottawattamie	1,529	S	X	--	X	X	X
Longs Landing	IA	Pottawattamie	24	L	X	X	X	--	X*
Total Identified Acreage	--	--	7,421	--	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Indian Cave State Park, east of Shubert in Richardson and Nemaha counties, Nebraska, is the largest recreation area within this study reach. Common activities at the site include camping, picnicking, fishing, hunting, boating, and fishing. Catfish, crappie, carp, and buffalo are common fish species found within the park. The Indian Cave area provides boat access and contains historic sites.

The Riverview Marina State Recreation Area, near the historic Arbor Lodge, provides many different recreational opportunities, including camping, boating, fishing, and hunting. North of Nebraska City in Otoe County, the recreation area supports a diversity of fish and wildlife species, such as carp, buffalo, catfish, crappie, quail, rabbit, and squirrel (Sportsman's Atlas Co., 1994).

The Brownville State Recreation Area, site of historic "Meriwether Lewis", is in Brownville in Nemaha County (Sportsman's Atlas Co., 1994). Camping, boating, fishing, and picnicking are available recreational opportunities.

In the southwest corner of Pottawattamie County, Iowa, Lake Manawa State Park provides picnicking, camping, and fishing opportunities. An historic site is also within the vicinity. Waubonsie State Park, northwest of Hamburg in Fremont County, provides camping, picnicking, and hiking and bridle trails.

Big Lake State Park, southwest of Mound City in Holt County, Missouri, is adjacent to Big Lake, a large oxbow lake. Many different species of birds migrate through the park, including American white pelicans, great blue herons, pintails, teals, snow geese, mallards, Canada geese, and

cormorants. Big Lake State Park was acquired from the state in 1932 and is a short distance from the Squaw Creek National Wildlife Refuge. Recreational opportunities include camping; boating; and fishing for catfish, carp, crappie, bass, and bluegill (Missouri DNR, 1992).

3.5.9 Data Gaps

The NWI data only covered 22 percent of this reach. Therefore, it was not considered sufficient for inclusion. Wetland acreage was taken from the land use/land cover data and descriptions were developed from USGS maps.

3.5.10 References Cited

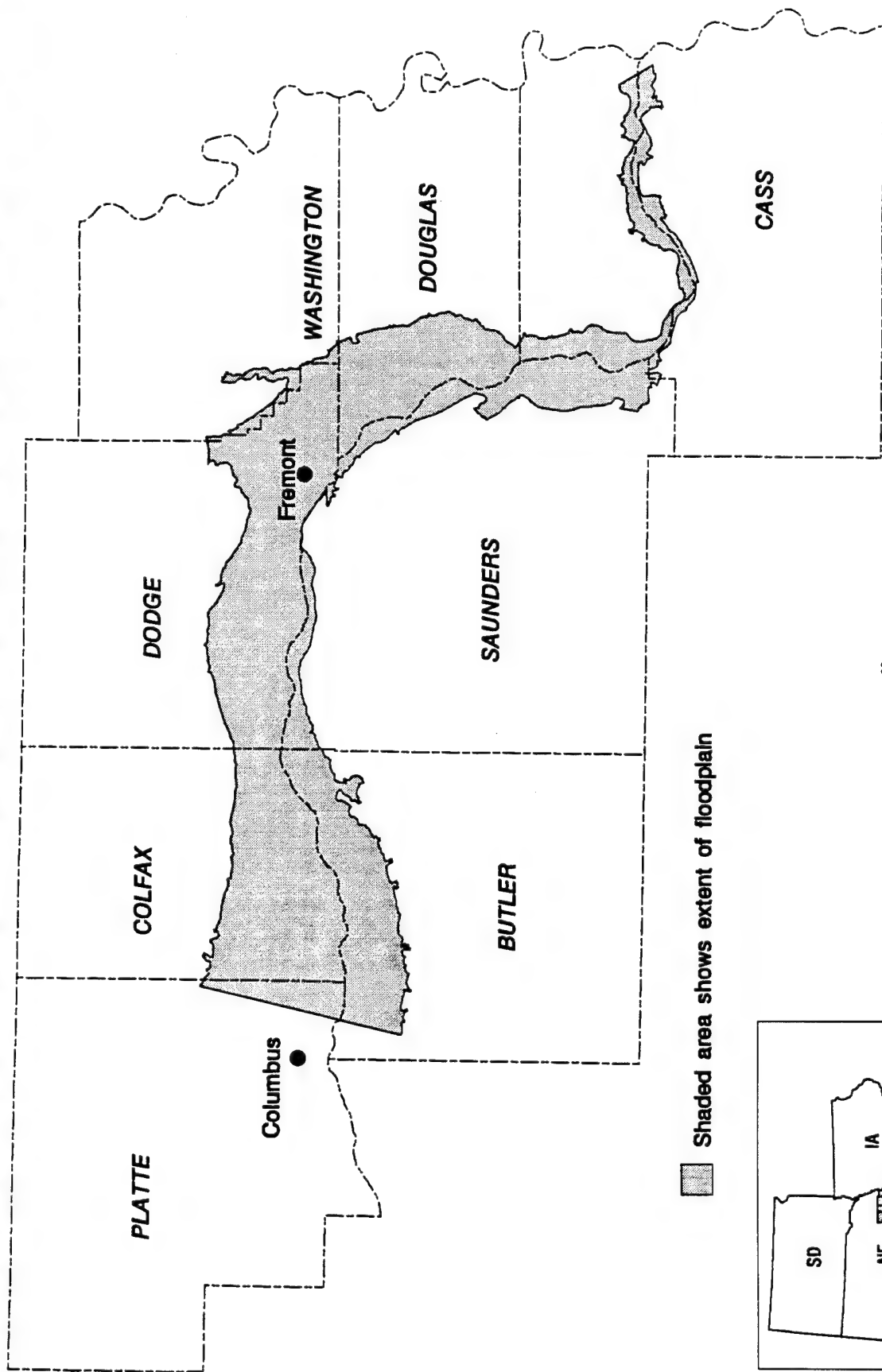
- Bassett, B. 1991. *Enjoying the Wide Missouri*. Missouri Department of Conservation. Jefferson City, MO.
- Fleckenstein, J. 1992. *Iowa State Preserves Guide*. Iowa Department of Natural Resources. Des Moines, IA.
- Johnsguard, P.A. 1980. *A revised list of the birds of Nebraska and Adjacent Plains States*. Occasional papers of the Nebraska Ornithol Union, No. 6 Lincoln. Lincoln, NE.
- Kramer, L. 1993. *Missouri Natural Features Inventory*. Missouri Department of Conservation. Jefferson City, MO.
- Missouri Department of Natural Resources. 1992. Big Lake State Park pamphlet. Jefferson City, MO.
- Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.
- Sportsman's Atlas Co. 1994. *Nebraska Sportsman's Atlas*. Lytton, IA.
- Steinauer, G. 1994. Telephone Conversation. Nebraska Game and Parks. Lincoln, NE.
- Thom, I. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.
- U.S. Army Corps of Engineers. 1993. *Missouri River Master Water Control Manual*. Volume 7F, Environmental Studies.
- U.S. Fish and Wildlife Service. 1992. Squaw Creek National Wildlife Refuge pamphlet. Mound City, MO.

3.6 PLATTE RIVER

This study reach begins in Platte County, Nebraska where the Loup River joins the Platte River east of Columbus (see Figure 3-6). It adjoins nine counties and ends at the confluence with the Missouri River, in Cass and Sarpy Counties. It is approximately 104 river miles in length. Freemont, Plattsmouth, and Louisville, Nebraska are the major communities along this reach. The Loup and Elkhorn Rivers and Salt Creek are the primary tributaries that enter the Platte River along this reach.

3.6.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.6-1. Descriptions of the state soil associations are provided in Appendix B.



Shaded area shows extent of floodplain

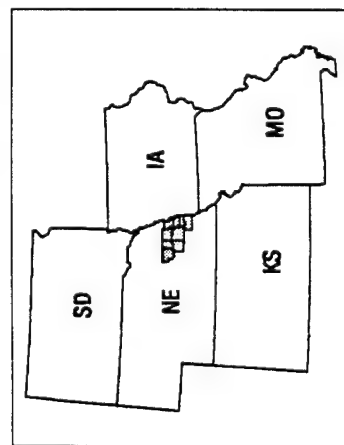


Figure 3-6
Platte River

Table 3.6-1

**SOIL ASSOCIATIONS
PLATTE RIVER**

Soil Association	State	Occurrences	Acres	Percent
ALDA-PLATTE-LESHARA	NE	3	37,190	10
COLY-ULY-HOBBS	NE	11	220	< 1
GIBBON-LUTON-SALTINE	NE	5	181,400	46
HOBBS-HORD-HALL	NE	2	6,210	2
HORD-HALL-HOBBS	NE	1	18,210	5
HORD-HALL-WOOD RIVER	NE	1	3,550	1
IDA-MONONA-NAPIER	NE	12	1,250	< 1
INAVALE-CASS-BARNEY	NE	12	85,140	22
KENNEBEC-WABASH-ZOOK	NE	4	7,520	2
MARSHALL-PONCA-JUDSON	NE	15	1,610	< 1
MONONA-IDA-JUDSON	NE	35	7,300	2
MOODY-FILLMORE-NORA	NE	6	24,350	6
MOODY-NORA-JUDSON	NE	3	1,570	< 1
NORA-CROFTON-MOODY	NE	6	1,040	< 1
O'NEILL-BROCKSBURG-HORD	NE	2	9,250	2
SHARPSBURG-FILLMORE-BUTLER	NE	7	1,390	< 1
SHARPSBURG-PAWNEE-JUDSON	NE	5	1,820	< 1
SIMEON-MEADIN-VALENTINE	NE	1	1,890	< 1
ZOOK-LESHARA-WANN	NE	1	10	< 1
SOIL ASSOCIATIONS SUBTOTAL		132	390,920	100
UNCLASSIFIED AQUATIC	NE	5	24,540	-
SOILS AND AQUATIC TOTAL		137	415,460	-

3.6.2 Land Use/Land Cover

3.6.2.1 Land Use

The total floodplain area of this reach covers 415,460 acres (Table 3.6-2). The floodplain is 10 to 15 miles wide at the western end in Colfax and Butler Counties. In Dodge, Douglas and Sarpy Counties the floodplain encompasses the Elkhorn River, resulting in one common floodplain. The floodplain narrows dramatically between steep bluffs where it turns east in Sarpy and Cass Counties. Columbus and Fremont, Nebraska are the two largest towns along this reach. Numerous highways are in the floodplain. They parallel and cross the river. Rail lines follow the river through the entire reach. Agriculture is the predominant land use in this reach. Corn, soybeans, grain sorghum, alfalfa, and oats are the principal crops.

Table 3.6-2

LAND USE/LAND COVER PLATTE RIVER

Cover Type	Acres	Percent
Urban	17,970	4
Agriculture	317,610	76
Range	35,280	9
Upland Forest	40	< 1
Wetland*	16,920	4
Water	19,470	5
Barren	8,170	2
Total	415,460	100

*No NWI data available for forested wetland.

3.6.2.2 Vegetation

Native prairie vegetation in this reach includes big and little bluestem, Indian grass and switchgrass. A consistent band of forest upland is adjacent to the river all along its length. Green ash, hackberry, oak, box elder, black walnut, cottonwoods, and maple trees are species found in the bottomlands.

3.6.2.3 Plant Species of Special Concern

The only protected plant species known to occur along this reach is the Federally-threatened prairie white-fringed orchid (Table 3.6-2a). It has been identified in Sarpy County on the Platte River Bluffs (Nebraska NHI, 1994).

Table 3.6-2a

**PROTECTED PLANT SPECIES
PLATTE RIVER**

Species	Federal Status	Nebraska Status	Site Occurrences by County
Prairie White Fringed Orchid	T	T	Sarpy

T = listed as threatened

3.6.3 Aquatic Resources

3.6.3.1 Wetlands

No NWI data is available for this study reach. However, wetlands were identified within this study reach by reviewing USGS topographic maps. The total acres of wetlands was taken from the land use/land cover data.

Approximately 16,920 acres of vegetated wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Numerous islands are within the channel of the Platte River; many have wetland communities on them. Other wetlands are directly adjacent to the main river channel or along some of the larger tributaries, lakes, or ponds. For the most part, wetlands exist as small isolated ecosystems. This is primarily due to the large amount of agricultural land within the Platte River floodplain. The confluence of the Platte and Missouri Rivers is a mosaic of sandbars, ponds, emergent and shrub/forest wetland and floodplain forest.

3.6.3.2 Lakes and Ponds

Approximately 440 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 8,420 acres. The average size of each pond or lake is less than 20 acres.

A series of ponds is found west of Valley. Another group of lakes and ponds, including several small oxbow lakes is south of Valley. A concentration of lakes and ponds extends from Fremont west to Ames. Six lakes and ponds are within the Two Rivers Wildlife Management Area. Twenty lakes are within the Fremont Lakes State Recreation Area.

3.6.3.3 Tributaries

Several tributaries empty into the Platte River within this particular segment. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Fourmile Creek	N.W. of Plattsmouth
Wahoo Creek	E. of Ashland
Elkhorn Creek	E. of Wann
Shell Creek	E. of Schuyler
Loup River	E. of Columbus

3.6.4 Fisheries

This reach of the Platte River provides a diversity of habitats for aquatic species. The Platte River is listed as a Class I fishery in the state of Nebraska. The Platte River is the second largest river in Nebraska and is a classic example of a Great Plains River. This reach of the Platte consists of a shallow wide-braided channel with a multitude of sandbars. Major game fishes known from this reach of the Platte include largemouth bass, northern pike, bluegill, bullhead, channel catfish, and crappie. Carp, buffalo, and drum are also found throughout this reach.

3.6.4.1 Aquatic Species of Special Concern

The pallid sturgeon is the only protected aquatic species known to occur in from this reach of the Platte River (Table 3.6-4). The Federally and state-endangered pallid sturgeon has recently been observed in Sarpy County near the mouth of the Elkhorn River.

Table 3.6-4

PROTECTED AQUATIC SPECIES PLATTE RIVER

Species	Federal Status	Nebraska Status	Site Occurrences by County
Pallid Sturgeon	E	E	Sarpy (2)

E = listed as endangered

T = listed as threatened

3.6.4.2 Important Aquatic Habitat

Important habitat for aquatic species occurs throughout the Platte River. The mouth of the Elkhorn and the confluence of the Platte with the Missouri River are probably the two most important habitat areas in this reach. These areas provide important habitat for both the pallid and lake sturgeons. Concentrations of islands near Northbend and Louisville on the Platte provide sloped banks important to many species for spawning. The numerous sandbars scattered throughout this reach of the Platte provide important resting and spawning habitat for fish.

3.6.5 Wildlife

The Platte River provides habitat for a variety of wildlife species. Numerous sandbars, islands, wooded banks, and wet meadows scattered throughout this reach provide valuable habitat for many wildlife species. The Platte River also provides important migrational habitat for many species of waterfowl and bald eagles. Major waterfowl species known to occur in this reach include mallard, wood duck, blue-winged teal, and Canada and snow geese. Snow geese in particular concentrate in large numbers throughout this reach during migration. Other common wildlife species in this reach include white-tailed deer, ring-necked pheasant, wild turkey, coyote, and various species of furbearers.

3.6.5.1 Wildlife Species of Special Concern

Four wildlife species with protected status are in this reach (Table 3.6-5). All are birds and have Federal protection under the Endangered Species Act. The piping plover and interior least tern have been observed in every county in this reach except Washington County. Saunders (14), Sarpy (12), and Dodge and Cass (22) counties had the highest number of occurrences of protected species in this reach. A pair of bald eagles nested in Douglas County in 1991 but no young survived to fledgling (NGPC, 1993). A pair of bald eagles also nested in Saunders County in 1994 (USFWS, 1994). The river otter has also been reported in this reach. It is listed as endangered in Nebraska.

Table 3.6-5

PROTECTED WILDLIFE SPECIES PLATTE RIVER

Species	Federal Status	Nebraska Status	Site Occurrences by County
Piping Plover	E	T	Butler(2), Platte(2), Cass(9), Dodge(9)
Interior Least Tern	E	E	Butler(2), Platte(3), Cass(13), Sarpy(11), Colfax(11), Dodge(13), Douglas(8), Saunders(13)
Peregrine Falcon	E	E	Douglas, Sarpy
Bald Eagle	E	E	Douglas, Saunders

E = listed as endangered

T = listed as threatened

3.6.5.2 Important Wildlife Habitat

The upper part of this reach with its numerous sandbars and islands provides important habitat for bald eagles, piping plovers, and interior least terns. The Schilling Wildlife Area in Cass County provides important habitat for all species of waterfowl and bald eagles. Concentrations of islands and sandbars near Louisville and Northbend on the Platte River provide important nesting habitat for the interior least terns and piping plovers. In Cass County near Cedar Creek, numerous sandbars that also provide important habitat for interior least terns and piping plovers. The mouth of the Elkhorn River and the confluence of the Platte River with the Missouri both provide important fishing habitat for bald eagles in winter.

3.6.6 Fish and Wildlife Management Areas

This study reach contains three major FWMAs, in Cass, Butler, and Colfax counties. State FWMAs account for two of the three management areas; the ownership of the remaining area is undetermined. No Federal recreation areas occur within this study reach. The three management areas are listed by state in Table 3.6-6; and the acreage is also provided.

Table 3.6-6

FISH AND WILDLIFE MANAGEMENT AREAS PLATTE RIVER

Management Areas	State	County	Type	Acres
Cedar Creek Island State Wildlife Mgmt. Area	NE	Cass	S	ND
Skull Creek State Wildlife Management Area	NE	Butler	S	ND
Whitetail Wildlife Management Area	NE	Colfax	ND	216
Total Identified Acreage	--	--	--	216

Type: Federal (F), State (S), Local (L) ND = No Data

The Whitetail Wildlife Management Area, south of Schuyler near Highway 15 in Colfax County, permits hunting for waterfowl, deer, dove, rabbit, and quail.

Cedar Creek Island SWMA and Skull Creek SWMA are small SWMAs within this study reach. The Cedar Creek Island area is north of Cedar Creek in Cass County. The Skull Creek area is south of Linwood in Butler County.

3.6.7 Natural Areas

No natural areas were identified on the Platte River (Steinauer, 1994).

3.6.8 Recreation Areas

This study reach contains seven major recreation areas in four Nebraska counties. State parks and recreation areas account for five of the seven recreation areas; the remaining two recreation areas are locally-owned. No Federal recreation areas occur within this study reach. Camping and water activities were the most commonly available recreational opportunities along this study reach. Picnicking, hunting/fishing, and hiking/biking were less common. The seven recreation areas and the activities which they provide are listed in Table 3.6-8.

Table 3.6-8

**RECREATION AREAS
PLATTE RIVER**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Louisville Lakes State Recreation Area	NE	Cass	142	S	X	X	X	--	X
Platte River State Park	NE	Cass	ND	S	--	X	--	--	X
Eugene T. Mahoney State Park	NE	Cass	574	S	X	X	--	X	X*
Schramm Park Recreation Area	NE	Sarpy	340	L	--	--	--	--	--
Two River State Recreation Area	NE	Douglas	643	S	X	X	X	X	X*
Platte River Landing	NE	Douglas	2	L	--	X	X	--	X*
Fremont Lake State Recreation Area	NE	Dodge	670	S	X	X	X	--	X*
Total Identified Acreage	--	--	2,371	--	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Fremont Lake State Recreation Area is the largest recreation area within this study reach. West of Fremont, the Fremont Lake area contains 20 lakes covering 280 acres. Camping, swimming, picnicking, fishing, and hunting are common activities (NGPC, 1992).

Two Rivers State Recreation Area, west of Omaha in Douglas County, contains six lakes. Opportunities for recreation include fishing, picnicking, boating, camping, bicycling, hunting, and swimming. It is one of the most-used recreation areas in the state due to its proximity to the Omaha metropolitan area (NGPC, undated).

Eugene T. Mahoney State Park, west of South Bend in Cass County, contains a driving range and miniature golf course. Recreational opportunities include camping, picnicking, swimming, boating, and trail rides.

Louisville Lakes State Recreation Area, north of Louisville in Cass County, provides camping, picnicking, swimming, and fishing facilities. Common species of fish caught within the park include channel catfish, crappie, bluegill, and largemouth bass (NGPC, 1992). West of Louisville Lake State Recreation Area in Cass County, Platte River State Park offers cabins, picnic tables, trail rides, swimming facilities, and paddle boat rental (NGPC, undated).

3.6.9 Data Gaps

The available NWI coverage amounted to less than 10 percent of this reach. Therefore, the acreage for total wetlands was taken from the land use/land cover data. The description of wetlands was derived by review of USGS maps.

3.6.10 References Cited

Nebraska Game and Parks Commission. Undated. *Platte River State Park* pamphlet. Lincoln, NE.

Nebraska Game and Parks Commission. Undated. *Two Rivers State Recreational Area* pamphlet. Lincoln, NE.

Floodplain Management Assessment

Nebraska Game and Parks Commission. 1992. *Fremont Lakes State Recreation Area* pamphlet. Lincoln, NE.

Nebraska Game and Parks Commission. 1992. *Louisville State Recreation Area* pamphlet. Lincoln, NE.

Nebraska Game and Parks Commission. 1993. *Nebraska's Threatened and Endangered Species: Bald Eagle*. Lincoln, NE.

Nebraska Natural Heritage Inventory. 1994. Database Search. Game and Parks Commission. Lincoln, NE.

Steinauer, G. 1994. *Telephone Conversation*. Nebraska Game and Parks Commission. Lincoln, NE.

U.S. Fish and Wildlife Service. 1994. *Correspondence from Nebraska field office*. Grand Island, NE.

3.7 ELKHORN RIVER

This reach begins near Nickerson, in Dodge County, Nebraska (see Figure 3-7). It runs through four counties (Dodge, Washington, Douglas and Cass) and ends at the confluence of the Elkhorn with the Platte River in Sarpy County. It is approximately 40 river miles in length. Arlington and Waterloo, Nebraska are the major communities along this reach. This reach falls completely within the Platte River floodplain. Therefore, data compiled from the digital information on the floodplain was not separable for the Elkhorn River; See Section 3.7.9, Data Gaps, for further explanation.

3.7.1 Soils

Soils information for this reach is contained within section 3.6.1 on the Platte River. Descriptions of the state soil associations are provided in Appendix B.

3.7.2 Land Use/Land Cover

3.7.2.1 Land Use

The land use data for this reach is included in Section 3.6.2. Several small communities are along the river in this primarily rural area. Nearly the entire area is in farms, primarily cropland. Wheat and corn are the primary cash crops. Grain sorghum, soybeans, alfalfa, and hay are grown for livestock.

3.7.2.2 Vegetation

Extensive areas of woodland are along the river. Green ash, hackberry, oak, box elder, black walnut, and maples are the dominant species. Pastures of native grasses include big and little bluestem, switchgrass, Indian grass, porcupinegrass, and sideoats gramma.

3.7.2.3 Plant Species of Special Concern

No plant species of special concern were identified in the Natural Heritage database search for this reach.

3.7.3 Aquatic Resources

3.7.3.1 Wetlands

No NWI data was available for this study reach. However, wetlands were identified within this study reach by reviewing USGS topographic maps. Because this study section is contained within the floodplain of the Platte River, the land use/land cover data was not separable for the Elkhorn River.

Wetland areas are present to some extent throughout the floodplain of this study reach. Most of the wetlands are directly adjacent to the main river channel or along some of the larger tributaries, lakes, or ponds. For the most part, wetlands exist as small isolated ecosystems. This is primarily due to the large amount of agricultural land within the river floodplain.

Several wetland areas are at the confluence of the Elkhorn and Platte Rivers. These areas are associated with islands in the Platte River.

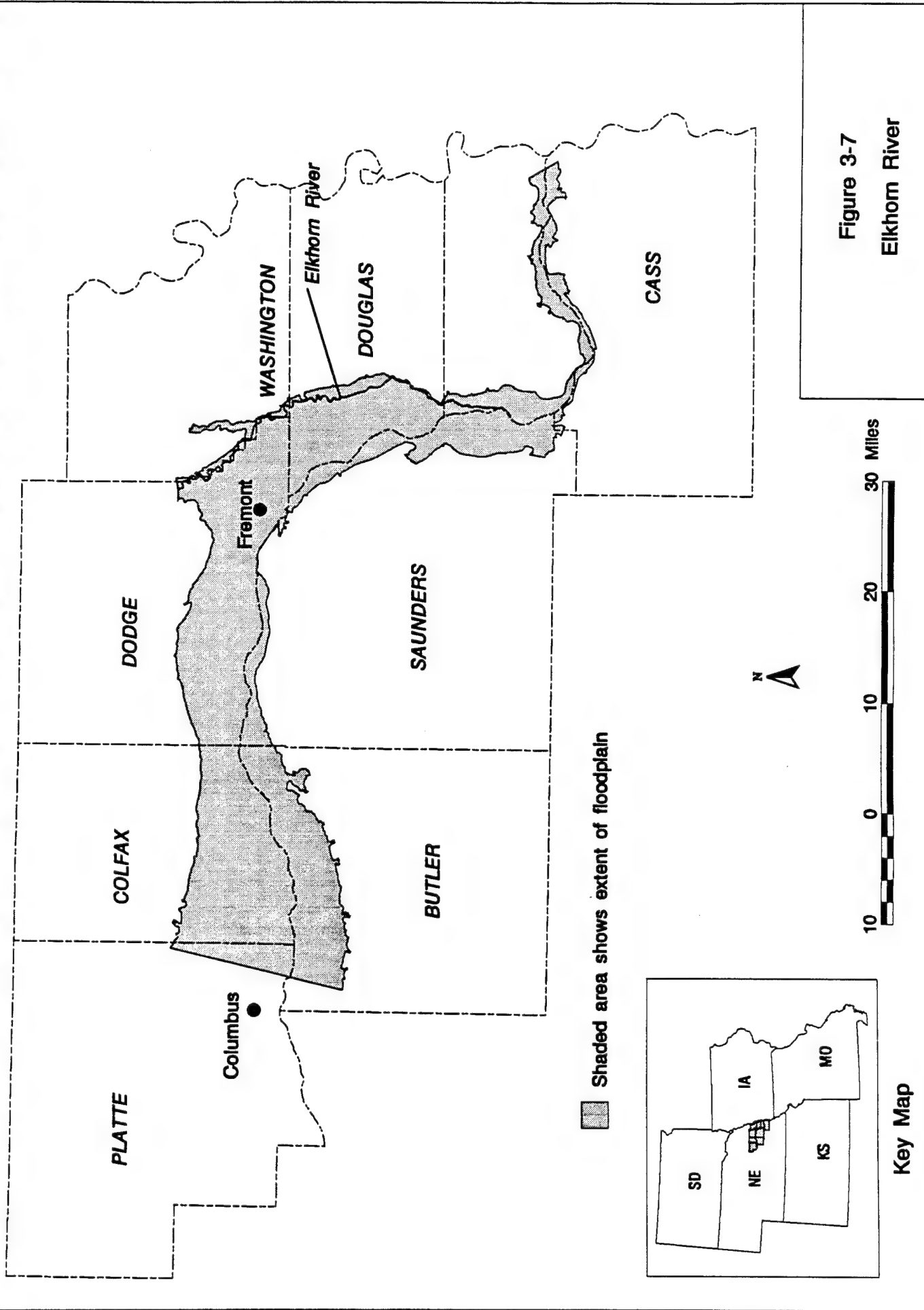


Figure 3-7
Elkhorn River

3.7.3.2 Lakes and Ponds

Several small ponds and oxbow lakes are in this study area. These lakes are also within the Platte River floodplain. Following is a list of the largest lakes and their locations:

Lake	Location
Snyder Lake	N. of Fremont
Kings Lakes	N. of Elkhorn
Twin Lakes	W. of Omaha

West of Omaha, Nebraska wetland areas are associated with several lakes. This includes the Twin Lakes area south of Elkhorn, Nebraska and Kings Lake and several other small ponds north of Elkhorn. Several small ponds and oxbow lakes west of Fremont have associated wetland areas. This includes Snyder Lake, which is an oxbow lake on the west side of the river between Fremont and Nickerson.

3.7.3.3 Tributaries

Several tributaries empty into the Elkhorn River within this particular segment. Many of these are within the Platte River floodplain. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Rawhide Creek	N. of Elkhorn
Brown Creek	E. of Fremont
Maple Creek	E. of Nickerson

3.7.4 Fisheries

The Elkhorn is a single-channel river providing habitat for various aquatic species. The Elkhorn River is listed as a Class I (highest-valued) fishery resource in the state of Nebraska (USFWS, 1978). Major game species known from this reach include channel and flathead catfish, northern pike, bluegill, and crappie. Minor species known from this reach include largemouth bass, white bass, and walleye. Carp, buffalo, and freshwater drum are also common in this reach of the Elkhorn.

3.7.4.1 Aquatic Species of Special Concern

No protected aquatic species were identified in the database search for this reach of the Elkhorn River.

3.7.4.2 Important Aquatic Habitat

The Elkhorn River with its numerous sandbars provides important habitat for catfish and panfish as spawning and rearing areas. Rawhide and Maple Creeks along this reach of the Elkhorn provide important habitat for catfish and other species. The confluence of the Elkhorn with the Platte River provides important habitat for all species in both the Elkhorn and Platte Rivers. During periods of

high flow, major game species such as northern pike and catfish and other species migrate up into this reach of the Elkhorn River.

3.7.5 Wildlife

The Elkhorn River corridor provides important habitat for many species of wildlife. Major wildlife species known to occur in this reach include white-tailed deer, ring-necked pheasant, wild turkey and various species of furbearers such as beaver, muskrat, coyote, and red fox. The Elkhorn River provides important habitat for many species of waterfowl. Major waterfowl species known to occur in this reach include mallard, wood duck, pintail, blue-winged teal, northern shoveler, and Canada and snow geese. Bald eagles and sandhill cranes are also known from throughout this reach of the Elkhorn River.

3.7.5.1 Wildlife Species of Special Concern

The bald eagle is the only protected species occurring in this reach (Table 3.7-5).

Table 3.7-5

PROTECTED WILDLIFE SPECIES ELKHORN RIVER

Species	Federal Status	Nebraska Status	Site Occurrences by County
Bald Eagle	E	E	All counties

E = listed as endangered

3.7.5.2 Important Wildlife Habitat

The Elkhorn River corridor provides important habitat for numerous wildlife species. Sandy banks and sandbars along the Elkhorn River provide important nesting habitat for interior least terns and piping plovers. The confluence of the Elkhorn River with the Platte River provides an important fishing area for bald eagles in winter. No other areas have been identified by state or Federal agencies as important habitat along this reach of the Elkhorn River.

3.7.6 Fish and Wildlife Management Areas

No FWMAs were identified in this study reach.

3.7.7 Natural Areas

No natural areas were identified in this reach.

3.7.8 Recreation Areas

This study reach contains only one major recreation area, Elkhorn Crossing Recreation Area, northeast of Valley near the Elkhorn River in Douglas County, Nebraska. Recreational opportunities available at this park include camping, picnicking, and boating. Table 3.7-8 provides information on this area.

Table 3.7-8

**RECREATION AREAS
ELKHORN RIVER**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Elkhorn Crossing Recreation Area	NE	Douglas	23	L	X	X	--	--	X*
Total Identified Acreage	--	--	23	--	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

3.7.9 Data Gaps

Data on the Elkhorn River was limited by the fact that the portion within the study area falls within the floodplain of the Platte River. The digital data on soils and land use/land cover could not be separated for the Elkhorn only. That data is contained within the tables in Section 3.6 on the Platte River. NWI wetland data was provided for the Platte or Elkhorn Rivers. Descriptions were based on review of USGS maps.

3.7.10 References Cited

U.S. Fish and Wildlife Service. 1978. *Stream Evaluation Map, State of Nebraska*. Denver, CO.

3.8 LOUP RIVER

This reach begins at the west edge of Nance County, Nebraska and runs through three counties (see Figure 3-8). It ends at the confluence with the Platte River in Platte County. It is approximately 70 river miles in length. Fullerton and Columbus are the major communities along this reach. The Cedar River is the primary tributary that enters the Loup River along this reach.

The portion of the Loup River within the study area falls within the floodplain of the Platte River. Rather than include the whole floodplain of the Platte, a buffer of approximately 4,000 feet on either side of the Loup River was established.

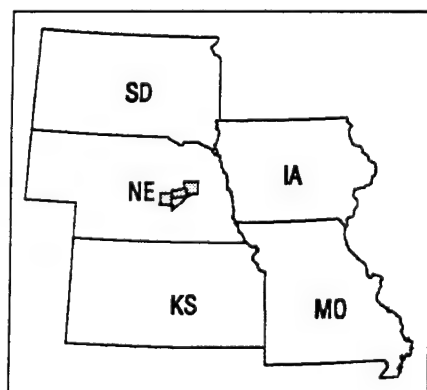
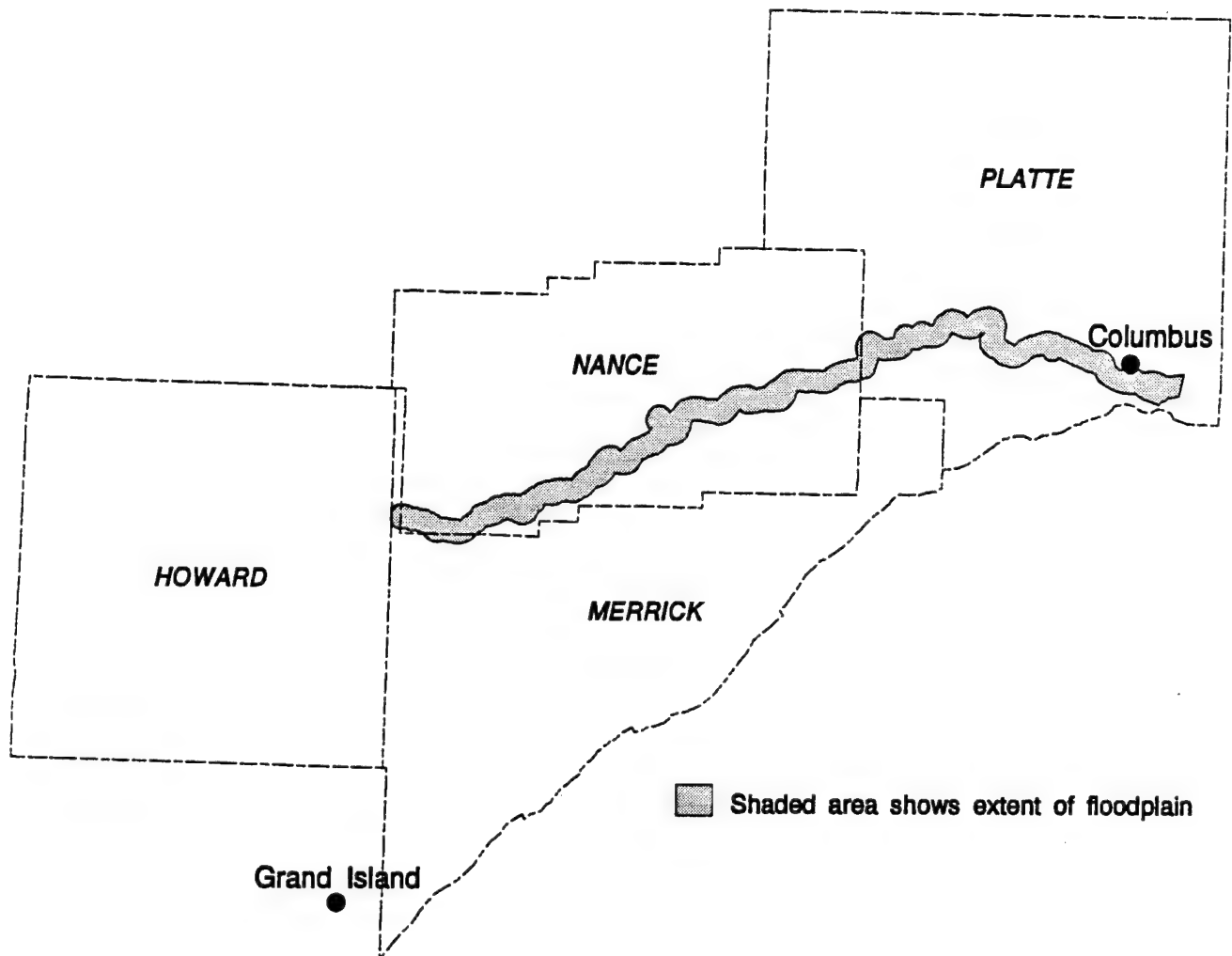
3.8.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.8-1. Descriptions of the state soil associations are provided in Appendix B.

Table 3.8-1

SOIL ASSOCIATIONS LOUP RIVER

Soil Type	State	Occurrences	Acres	Percent
GIBBON-LUTON-SALTINE	NE	6	3,560	6
HOBBS-HORD-HALL	NE	3	2,130	4
INAVALE-BOEL-LOUP	NE	3	35,710	65
O'NEILL-BROCKSBURG-HORD	NE	2	400	1
WANN-GIBBON-LESHARA	NE	5	230	<1
VALENTINE-THURMAN-DOGER	NE	1	230	<1
HERSH-VALENTINE-HOLDREGE	NE	7	5,170	9
NORA-CROFTON-MOODY	NE	6	680	1
INAVALE-CASS-BARNEY	NE	1	1,530	3
GOTHENBURG-PLATTE-LEX	NE	1	20	<1
HORD-HALL-HOBBS	NE	1	740	1
HORD-HALL-WOOD RIVER	NE	5	4330	8
ELS-VALENTINE-IPAGE	NE	1	10	<1
SOIL ASSOCIATIONS SUB TOTAL	--	42	54,740	100
UNCLASSIFIED AQUATIC	NE	2	3,230	--
SOILS AND AQUATIC TOTAL	--	--	57,970	--



Key Map



Figure 3-8
Loup River

3.8.2 Land Use/Land Cover

3.8.2.1 Land Use

The total area of the floodplain within this reach is approximately 58,000 acres. The river runs through a rural area with several small towns along its banks; Columbus is the largest town. A highway runs along the left descending bank of the floodplain between Columbus and Fullerton. The river is wider east of Genoa and has numerous islands and side channels. The floodplain extends about one mile north of the river along most of the reach. Agriculture is the primary land use in this region. Corn, soybeans, grain sorghum, alfalfa, and oats are the principal crops.

No quantitative data was available for land use for this reach. See 3.8.9 Data Gaps for further information.

3.8.2.2 Vegetation

The prairie vegetation native to this area includes big and little bluestem, Indian grass, porcupinegrass, and green needlegrass are characteristic species (SCS, 1981).

The sparse forest vegetation is found in patches in the riverway. Cottonwoods and willows are the dominant species. Occasional stands of burr oak, American elm, box elder, and green ash are found adjacent to the river (NGPC, 1992).

3.8.2.3 Plant Species of Special Concern

No plant species of special concern were identified in the database search for this reach.

3.8.3 Aquatic Resources

3.8.3.1 Wetlands

The reach along the Loup River includes approximately 12,210 acres of wetlands. The majority are classified as forested wetlands (Table 3.8-3).

Table 3.8-3

**AQUATIC RESOURCES
LOUP RIVER**

Wetland Class	Acres	Percent
Emergent	3,390	28
Forested	6,580	54
Scrub-Shrub	2,240	18
TOTAL	12,210	100

The vegetated wetlands appear to be evenly distributed along the river segment. Forested wetlands are found on numerous islands that have formed in the channel. Several forested islands are within

the George Syas Wildlife Management Area. A series of large islands lie in the channel from Fullerton downstream to the end of the reach.

3.8.3.2 Lakes and Ponds

A number of individual lakes and ponds are within the river segment; most are quite small. A series of small lakes and ponds are adjacent to the river southwest of Columbus. Another concentration of ponds is in Polk County.

3.8.3.3 Tributaries

Several tributaries empty into the Loup River along this reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Spiral Creek	Cushing
Rock Creek	E. of Cushing
Cottonwood Creek	Western Nance County
Horse Creek	W. of Fullerton
Cedar River	E. of Fullerton
Loup River Canal	S.W. of Genoa

3.8.4 Fisheries

Major species known to occur in this reach of the Loup River include channel and flathead catfish. Minor species include bluegill, crappie, and largemouth bass. The Loup Public Power Canal contains an important flathead catfish fishery. The Nebraska state record catfish was taken from this canal in Platte County. Generally, the Loup is a shallow sand-bottom river. Rough fish species known to occur in this reach include carp, carpsucker, and drum (Schuckman, 1994).

3.8.4.1 Aquatic Species of Special Concern

According to the search of the Natural Heritage database, no protected aquatic species are known to occur in this reach of the Loup River.

3.8.4.2 Important Aquatic Habitat

The Loup Public Power Company maintains a diversion canal on the Loup River near Genoa. The Genoa Diversion Canal diverts water from the Loup into the Platte River below Columbus. This canal supports an important flathead and channel catfish fishery. On occasion when water is diverted, water levels in the Loup River between Genoa and Beaver Creeks become significantly reduced (Schuckman, 1994). The diversion gates on the Loup provide an important concentration area for many species of fish. Beaver Creek in Platte County and the Cedar River in Nance County both provide important spawning and rearing habitat for channel and flathead catfish (Schuckman, 1994).

3.8.5 Wildlife

White-tailed deer, cottontail rabbits, ring-necked pheasants, bobwhite quail, and mourning doves are common throughout this reach of the Loup River. Wild turkey and numerous species of waterfowl

are also common throughout this reach. Major waterfowl species include mallard, pintail, wood duck, northern shoveler, and Canada goose. Badger are commonly seen on the upland areas of this reach. Bald eagles also occur throughout this reach (Schuckman, 1994).

3.8.5.1 Wildlife Species of Special Concern

The interior least tern, piping plover and bald eagle are the only three protected wildlife species known to occur along this reach (Table 3.8-5). All of these species have Federal protection under the Endangered Species Act and all three species occur in Nance and Platte counties.

Table 3.8-5

PROTECTED WILDLIFE SPECIES LOUP RIVER

Species	Federal Status	Nebraska Status	Site Occurrences by County
Bald Eagle	E	E	Platte Nance
Interior Least Tern	E	E	Platte(11) Nance(12)
Piping Plover	T	T	Platte(10) Nance(11)

E = listed as endangered

T = listed as threatened

3.8.5.2 Important Wildlife Habitat

Gravel bars and sandbars scattered throughout this reach provide important habitat for the piping plover and interior least tern. The George Syas Wildlife Area in Platte County provides important habitat for migrating waterfowl and bald eagles. Wetland areas in Nance County west of Fullerton also provide important habitat for bald eagles and numerous species of waterfowl (Schuckman, 1994). Sand and gravel pits along this reach provide important nesting habitat for the least tern and piping plover. This area of the Loup River has been identified as being within the whooping crane migration corridor and as possibly containing important habitat for migrating whooping cranes (USFWS, 1994).

3.8.6 Fish and Wildlife Management Areas

This study reach contains four major FWMAs, all of which are in Nebraska. Furthermore, the management areas are in Nance and Platte counties. No Federal recreation areas occur within this study reach. The four management areas by state and their acreage are listed in Table 3.8-6.

Table 3.8-6

**FISH AND WILDLIFE MANAGEMENT AREAS
LOUP RIVER**

Management Areas	State	County	Type	Acres
Looking Glass Creek Wildlife Mgmt. Area	NE	Platte	ND	67
George Syas Wildlife Management Area	NE	Platte	ND	917
Prairie Wolf State Wildlife Mgmt. Area	NE	Nance	S	315
Loup Lands Wildlife Management Area	NE	Nance	ND	485
Total Identified Acreage	--	--	--	1,784

Type: Federal (F), State (S), Local (L)

ND = No Data

The George Syas Wildlife Management Area is the largest management area within this study reach, it is southwest of Monroe. Hunting for deer, pheasant, dove, rabbit, squirrel, and turkey is common.

Loup Lands Wildlife Management Area, southwest of Genoa, provides hunting opportunities for pheasant, quail, rabbit, and deer. Located south of Genoa in Nance County, Prairie Wolf SWMA offers hunting of waterfowl, dove, and pheasant. Looking Glass Creek Wildlife Management Area is south of Monroe in Platte County. The wildlife area contains two lakes consisting of 20 acres and provides lands for hunting.

3.8.7 Natural Areas

No natural areas were identified on the Loup River.

3.8.8 Recreation Areas

This study reach contains only one major recreation area, Headworks Park, southwest of Genoa in Nance County (Table 3.8-8). Fishing is the primary recreational opportunity available at the park.

Table 3.8-8

**RECREATION AREAS
LOUP RIVER**

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Headworks Park	NE	Nance	ND	L	--	--	X	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

3.8.9 Data Gaps

No land use/land cover quantitative data were available for this reach. Descriptions were developed from review of USGS maps. Due to the lack of land cover data, there was no information for lakes and ponds within the table on aquatic resources. Because the Loup River falls within the larger

floodplain of the Platte River, a buffer of approximately 4,000 feet on either side of the river was used to define the reach. The soils and wetland acreage data were based on this buffer.

3.8.10 References Cited

Nebraska Game and Parks Commission. 1992. *Nebraska's Vanishing Species*. Lincoln, NE.

Schuckman, J. 1994. *Telephone Conversation*. Nebraska Game and Parks Commission. Lincoln, NE.

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

U.S. Fish and Wildlife Service. 1994. *Correspondence*. Nebraska field office. Grand Island, NE.

3.9 NISHNABOTNA RIVER

This study reach covers the Nishnabotna River including parts of the east and west branches. The reach for the east branch begins near Shenandoah, in Page County while the reach for the west branch begins near Randolph in Fremont County. The branches merge near Riverton (see Figure 3-9). The reach is approximately 44 river miles in length. It runs through Atchison County in Missouri and ends at the confluence of the Nishnabotna River with the Missouri River floodplain. Hamburg, Sidney, and Shenandoah, Iowa are the major communities along this reach.

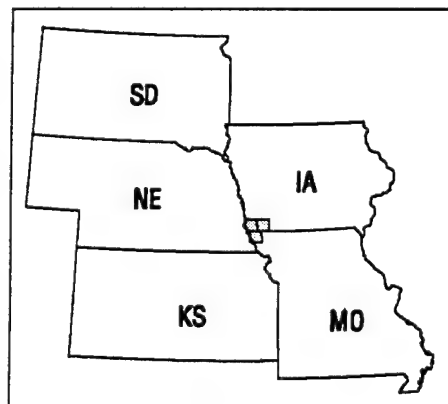
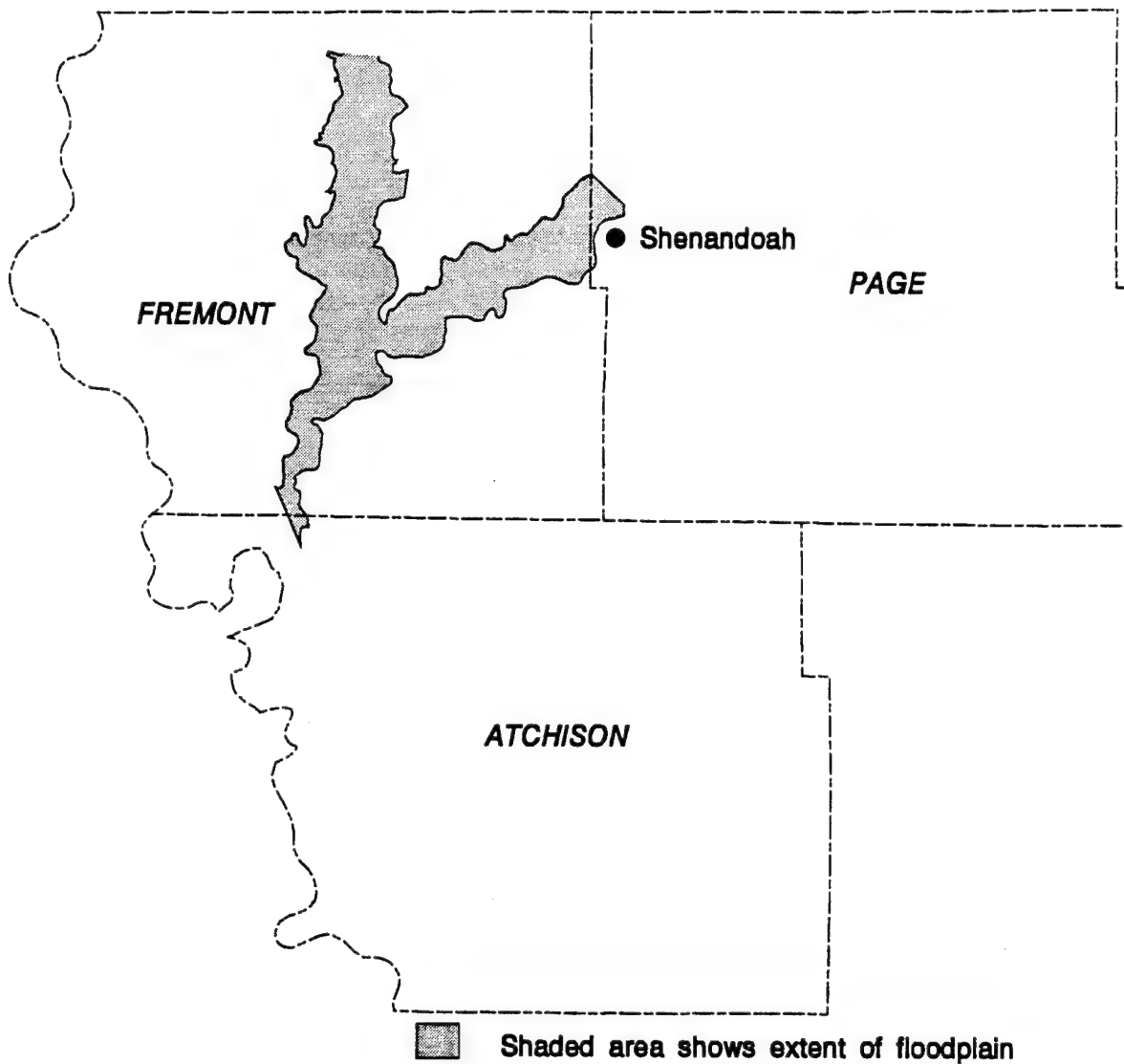
3.9.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.9-1. Descriptions of the state soil associations are provided in Appendix B.

Table 3.9-1

SOIL ASSOCIATIONS NISHNABOTNA RIVER

Soil Association	State	Occurrences	Acre	Percent
MONONA-MARSHALL-JUDSON	IA	8	2,900	5
KENNEBEC-MCPAUL-NODAWAY	IA	1	25,160	47
MARSHALL-NEVIN-MINDEN	IA	3	11,730	22
MARSHALL-EXIRA-SHELBY	IA	13	1,890	4
NODAWAY-COLO-ZOOK	IA	1	6,340	12
MONONA-IDA-NAPIER	IA	5	4,510	8
IDA-HAMBURG-NAPIER	IA	1	150	< 1
LUTON-SALIX-KEG	IA	1	320	< 1
LUTON-SALIX-KEG	MO	1	70	< 1
KENNEBEC-MCPAUL-NODAWAY	MO	1	290	< 1
MONOMA-IDA-NAPIER	MO	1	10	< 1
SOIL ASSOCIATIONS SUB TOTAL	--	36	53,370	100
UNCLASSIFIED AQUATIC	ALL	--	--	--
SOILS AND AQUATIC TOTAL	--	--	53,370	--



Key Map



Figure 3-9
Nishnabotna River

3.9.2 Land Use/Land Cover

3.9.2.1 Land Use

The total area of this reach covers 53,360 acres. Shenandoah is the largest town in this rural reach. Several small communities are also along the banks of the two rivers. A railroad line follows the east fork of the Nishnabotna River. Agriculture is the primary land use in this reach (Table 3.9-2). Corn, soybeans, and hay are the major crops. Raising cattle and hogs are also important enterprises.

Table 3.9-2

LAND USE/LAND COVER NISHNABOTNA RIVER

Cover Type	Acres	Percent
Urban	2,500	5
Agriculture	47,320	89
Range	340	< 1
Upland Forest	10	< 1
Wetland*	2,780	5
Water	420	< 1
Barren	0	0
Total	53,370	100

*No NWI data available for forested wetland.

3.9.2.2 Vegetation

The largest areas of forest are where the two branches of the Nishnabotna join. Trees in the bottomlands are eastern cottonwood, American elm, honey locust, sycamore, and black walnut. Tall prairie grasses native to this area include bluestem, Indian grass, and switchgrass (SCS, 1981).

3.9.2.3 Plant Species of Special Concern

No plant species of special concern were identified within this reach.

3.9.3 Aquatic Resources

3.9.3.1 Wetlands

No NWI data was available for this study reach. However, wetlands were identified within this study reach by reviewing USGS topographic maps. Based on the land use/land cover data, approximately 2,780 acres of vegetated wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Very few islands are within the channel of the Nishnabotna River. Therefore, most of the wetlands are directly adjacent to the main river channel or along some of the larger tributaries, lakes, or ponds. For the most part, wetlands exist as small

isolated ecosystems. This is primarily due to the large amount of agricultural land within the river floodplain.

Several wetland areas are south of Hamburg, Iowa where the Nishnabotna River passes through the Missouri River floodplain. Wetland areas are present along much of the river channel in this area and at the confluence of the Nishnabotna and Missouri Rivers. Wetlands are also associated with several lakes and ponds in this reach, including Greys Lake, which is the former channel of the Nishnabotna River.

North of Riverton, Iowa several wetland areas are in the floodplain between the east and west forks of the Nishnabotna River. These wetlands are associated with a lake that is within the Riverton Wildlife Area.

3.9.3.2 Lakes and Ponds

Only two individual lakes are within this river segment. The total surface area of these lakes and ponds is approximately 580 acres. These lakes are Riverton Lake near Riverton, Iowa and Greys Lake south of Hamburg, Iowa. Several wetland areas surround these lakes. Several other small ponds and oxbows are also found within this study area, mainly near the confluence of the Nishnabotna and Missouri Rivers.

3.9.3.3 Tributaries

Several tributaries empty into the Nishnabotna River within this particular segment. Most of these tributaries are small. Following is a list of the larger tributaries and their locations:

Tributary	Confluence Location
Honey Creek	N. of Riverton, IA
Walnut Creek	N. of Riverton, IA
Mill Creek	S. of Riverton, IA
Cooper Creek	S. of Hamburg, IA

3.9.4 Fisheries

The Nishnabotna River is very turbid with a silt or mud bottom providing exceptional habitat for catfish. Channel and flathead catfish are the two major game species known from this reach (Hudson, 1994). Carp and river carpsucker are also known from this reach. Minor species known from this reach include crappie and bluegill.

3.9.4.1 Aquatic Species of Special Concern

According to the search of the Iowa and Missouri Natural Heritage databases no state or Federal protected species are known to occur in from this reach of the Nishnabotna River.

3.9.4.2 Important Aquatic Habitat

Important habitat for catfish occurs throughout this reach (Hudson, 1994). The confluence of the east and west forks of the Nishnabotna River south of Riverton provides important spawning and feeding

habitat for flathead catfish. No other areas along this reach of the Nishnabotna River have been identified as important aquatic habitat.

3.9.5 Wildlife

Agricultural fields interspersed with strips of timber and riparian corridors throughout this reach provide important habitat for white-tailed deer, pheasant, bobwhite quail, cottontail rabbit, and wild turkey. Wetland areas along the Nishnabotna River provide habitat for migrating waterfowl. Common waterfowl species include mallard, wood duck, blue-winged teal, and northern shoveler. Canada and snow geese are also known from throughout this reach.

3.9.5.1 Wildlife Species of Special Concern

According to the search of the Missouri and Iowa Natural Heritage databases, no Federal or state protected species are known from this reach.

3.9.5.2 Important Wildlife Habitat

The Riverton Wildlife Area in Fremont County provides important habitat for pheasants and waterfowl (Sportsmans Atlas Co., 1994). The O.S. Wing Wildlife Area also in Fremont County near Hamburg provides important habitat for white-tailed deer, wild turkey, and squirrels (Sportsmans Atlas Co., 1994). No other areas have been identified as important by state or Federal agencies.

3.9.6 Fish and Wildlife Management Areas

This study reach contains three major FWMAs, two are found in Iowa. No Federal recreation areas occur within this study reach. The three management areas are listed by state in Table 3.9-6; the acreage of each is also provided.

Table 3.9-6

FISH AND WILDLIFE MANAGEMENT AREAS NISHNABOTNA RIVER

Management Areas	State	County	Type	Acres
Star School Hill Prairie Conservation Area	MO	Atchison	ND	129
O.S. Wing	IA	Fremont	S	140
Riverton Wildlife Area	IA	Fremont	S	2,720
Total Identified Acreage	--	--	--	2,989

Type: Federal (F), State (S), Local (L) ND = No Data

The Riverton Wildlife Area, north of Riverton in Fremont County, Iowa, is the largest management area within this study reach. Within the Riverton area, upland and shallow marsh, provides opportunities for fishing and hunting of pheasant, deer, quail, and waterfowl. Boat access is also available. O.S. Wing is a wildlife area southeast of Hamburg in Fremont County, Iowa. The site offers hunting of turkey, deer, and squirrel.

Located north of Watson in Atchison County, Missouri, the Star School Hill Prairie Conservation Area includes hunting, fishing, camping, and hiking facilities.

3.9.7 Natural Areas

No natural areas were identified within this reach.

3.9.8 Recreation Areas

No recreation areas were found in this study reach.

3.9.9 Data Gaps

NWI data were not available for this reach. Therefore, no adjustment of wetlands was possible in the land use/land cover table. Descriptions of wetlands were developed from USGS maps. Land cover data was available for lakes and ponds.

3.9.10 References Cited

Hudson, J. 1994. *Telephone Conversation*. Iowa Department of Natural Resources. Des Moines, IA.

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

Sportsman's Atlas Co. 1994. *Iowa Sportsman's Atlas*. Lytton, IA.

Sportsman's Atlas Co. 1994. *Nebraska Sportsman's Atlas*. Lytton, IA.

3.10 LITTLE NEMAHA RIVER

This reach begins in Otoe County, Nebraska at the upper end of the Little Nemaha River (see Figure 3-10). It runs through three counties in Nebraska and ends at the Little Nemaha's confluence with the Missouri River. It is approximately 56 river miles in length. Auburn is the major community along this rural reach.

3.10.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.10-1. Descriptions of the state soil associations are provided in Appendix B.

Table 3.10-1

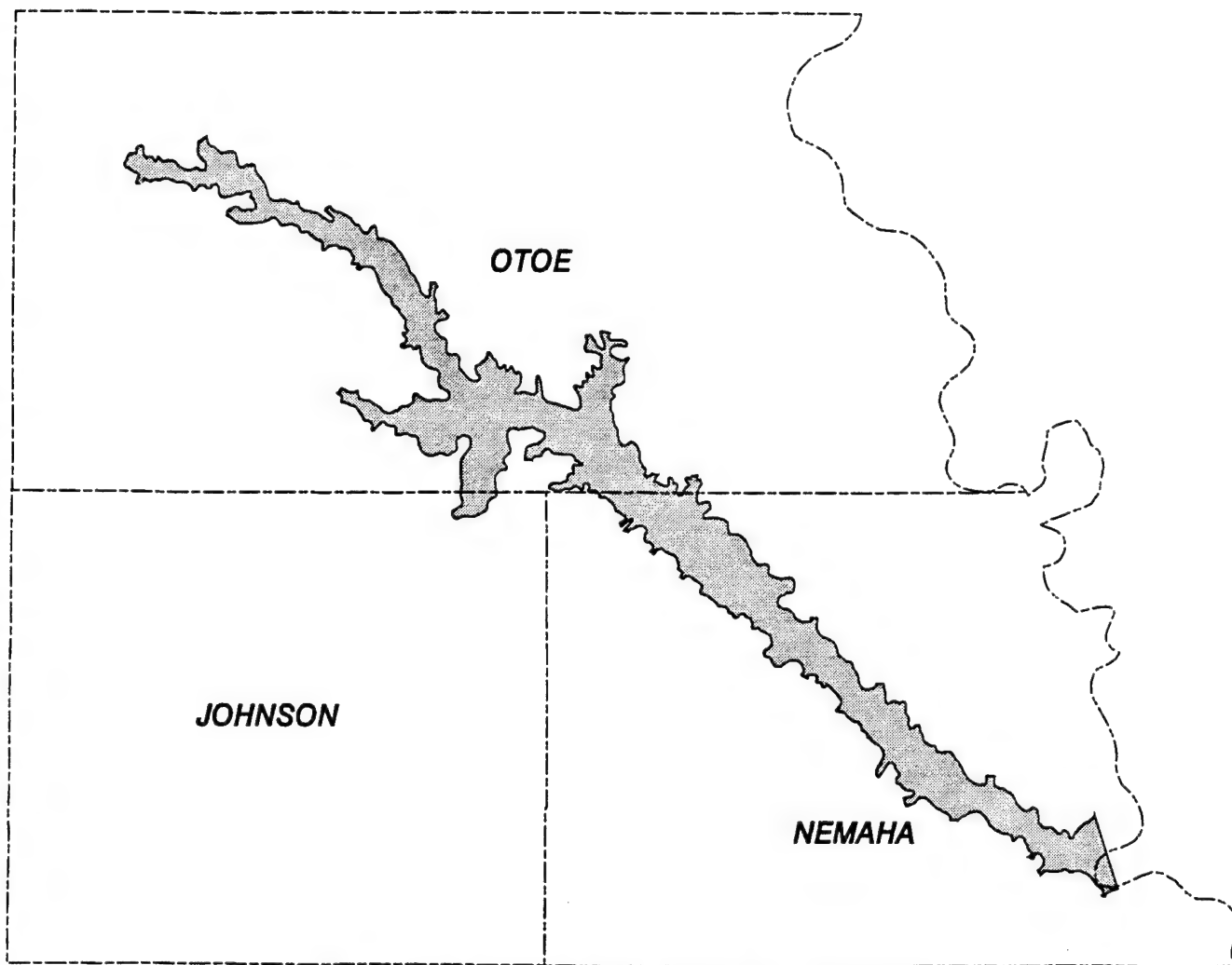
SOIL ASSOCIATIONS LITTLE NEMAHA RIVER

Soil Association	State	Occurrences	Acres	Percent
PAWNEE-BURCHARD-WYMORE	NE	38	5,200	9
KENNEBEC-WABASH-ZOOK	NE	1	45,080	77
WYMORE-MAYBERRY-PAWNEE	NE	29	4,600	8
SHARPSBURG-PAWNEE-JUDSON	NE	10	2,310	4
MARSHALL-PONCA-JUDSON	NE	6	140	< 1
MONONA-IDA-JUDSON	NE	2	10	< 1
IDA-MONONA-NAPIER	NE	1	160	< 1
ALBATON-ONAWA-HAYNIE	NE	2	930	1
ALBATON-ONAWA-HAYNIE	MO	1	250	< 1
SOIL ASSOCIATIONS SUB TOTAL	--	90	58,680	100
UNCLASSIFIED AQUATIC	ALL	2	290	--
SOILS AND AQUATIC TOTAL	--	--	58,970	--

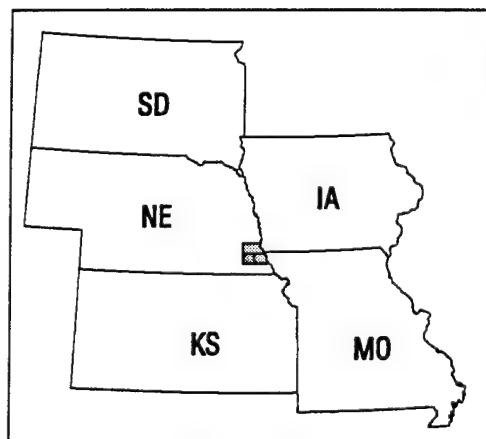
3.10.2 Land Use/Land Cover

3.10.2.1 Land Use

The total area of floodplain within this reach is 58,970 acres (Table 3.10-2). The floodplain ranges in width from one to two miles. Auburn is the largest community in the reach. Railroad lines are adjacent to the river for most of the reach. Several highways cross the river.



■ Shaded area shows extent of floodplain



Key Map



5 0 5 10 15 Miles

Figure 3-10
Little Nemaha River

Table 3.10-2

**LAND USE/LAND COVER
LITTLE NEMAHA RIVER**

Cover Type	Acres	Percent
Urban	790	1
Agriculture	51,790	88
Range	4,140	7
Upland Forest	10	< 1
Wetland*	1,990	3
Water	250	< 1
Barren	0	--
Total	58,970	100

*No NWI data available for forested wetland.

3.10.2.2 Vegetation

Agriculture is the primary land use. Wheat and corn are important cash crops. Grain sorghum, soybeans, alfalfa, and hay are also grown. Mid and tall prairie grasses are the native vegetation. Big and little bluestem, switchgrass, Indian grass, porcupinegrass, and sideoats gramma are dominant species (SCS, 1981). The only forest land is at the confluence of the Little Nemaha and Missouri Rivers. Species found along streams include green ash, hackberry, box elder, black walnut, and maple.

3.10.2.3 Plant Species of Special Concern

No plants of special concern were identified in the search of the database for this reach.

3.10.3 Aquatic Resources

3.10.3.1 Wetlands

No NWI data was available for this study reach. Wetlands were identified by reviewing USGS topographic maps. Based on land use/land cover data, approximately 1,990 acres of vegetated wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Very few islands are within the channel of the Little Nemaha River. Most of the wetlands are directly adjacent to the main river channel or along some of the larger tributaries, lakes, or ponds. For the most part, wetlands exist as small isolated ecosystems. This is primarily due to the large amount of agricultural land within the Little Nemaha River floodplain.

Near Nemaha, Nebraska several wetland areas are present at the confluence of the Little Nemaha and Missouri Rivers. A small lake is also present in this location. Wetland areas are also along the Missouri River in this location.

3.10.3.2 Lakes and Ponds

Approximately seven individual lakes and ponds are within this reach. The total surface area of these lakes and ponds is approximately 60 acres. The average size of each pond or lake is only 9 acres. The largest lake in this study area is south of Nemaha, Nebraska.

3.10.3.3 Tributaries

Several tributaries empty into the Little Nemaha River within this particular segment. Most of these tributaries are small perennial to intermittent streams. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
North Fork of the Little Nemaha River	N.W. of Auburn
South Fork of the Little Nemaha River	N.W. of Auburn
Rock Creek	N. of Auburn

3.10.4 Fisheries

The Little Nemaha River is listed as a Class I highest-valued fishery in Nebraska (USFWS, 1978). Channel and flathead catfish are common throughout this reach. Walleye and sauger occur in this reach but are not common. Other minor gamefish species include bluegill, crappie, and largemouth bass (Jackson, 1994).

3.10.4.1 Aquatic Species of Special Concern

The lake sturgeon is the only protected species known to occur along this reach (Table 3.10-4). The lake sturgeon is not protected under the Endangered Species Act, but is listed as threatened in Nebraska. The lake sturgeon has been observed in Nemaha County near the mouth of the Little Nemaha River.

Table 3.10-4

PROTECTED AQUATIC SPECIES LITTLE NEMAHA RIVER

Species	Federal Status	Nebraska Status	Site Occurrences by County
Lake Sturgeon	—	T	Nemaha

E = listed as endangered

T = listed as threatened

3.10.4.2 Important Aquatic Habitat

Numerous low-head dams along the Little Nemaha provide important deepwater habitat for channel and flathead catfish (Jackson, 1994). The south and north forks of the Little Nemaha River provide important spawning areas for catfish and other species. No other areas along this reach have been identified by state or Federal agencies as important habitat.

3.10.5 Wildlife

Major species of wildlife present in this reach of the Little Nemaha River include white-tailed deer, ring-necked pheasant, bobwhite quail, badger, and numerous species of waterfowl. The river otter, although not common, has been reported throughout this reach. Major waterfowl species include mallard, wood duck, northern shoveler, blue-winged teal, pintail, and the Canada goose (McDonald, 1994). Greater prairie chicken populations have increased over the last several years and they are often seen throughout this reach (McDonald, 1994).

3.10.5.1 Wildlife Species of Special Concern

The only protected wildlife species reported in this reach is the river otter (Table 3.10-5). The river otter is listed as endangered in Nebraska and occurs in Nemaha County.

Table 3.10-5

PROTECTED WILDLIFE SPECIES LITTLE NEMAHA RIVER

Species	Federal Status	Nebraska Status	Site Occurrences by County
River Otter	--	E	Nemaha

E = listed as endangered

3.10.5.2 Important Wildlife Habitat

Numerous tree plantings and conservation reserve program lands throughout this reach provide important habitat for prairie chickens, ring-necked pheasants, and other species. The area between Auburn and Nemaha provides important roosting and feeding habitat for bald eagles (McDonald, 1994). The riparian corridor along the Little Nemaha provides important escape cover for ring-necked pheasants and white-tailed deer.

3.10.6 Fish and Wildlife Management Areas

No FWMAs were identified in this study reach.

3.10.7 Natural Areas

No natural areas were identified in this study reach.

3.10.8 Recreation Areas

No recreation areas were identified in this study reach.

3.10.9 Data Gaps

No NWI data was available for this reach. The descriptions of wetlands were based on review of USGS maps. Due to the lack of NWI wetland data, no adjustment of wetlands within the land use/land cover table was possible.

3.10.10 References Cited

Jackson, J. 1994. *Telephone Conversation*. Iowa Department of Natural Resources. Des Moines, IA.

McDonald, M. 1994. *Telephone Conversation*. Nemaha Natural Resources District.

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

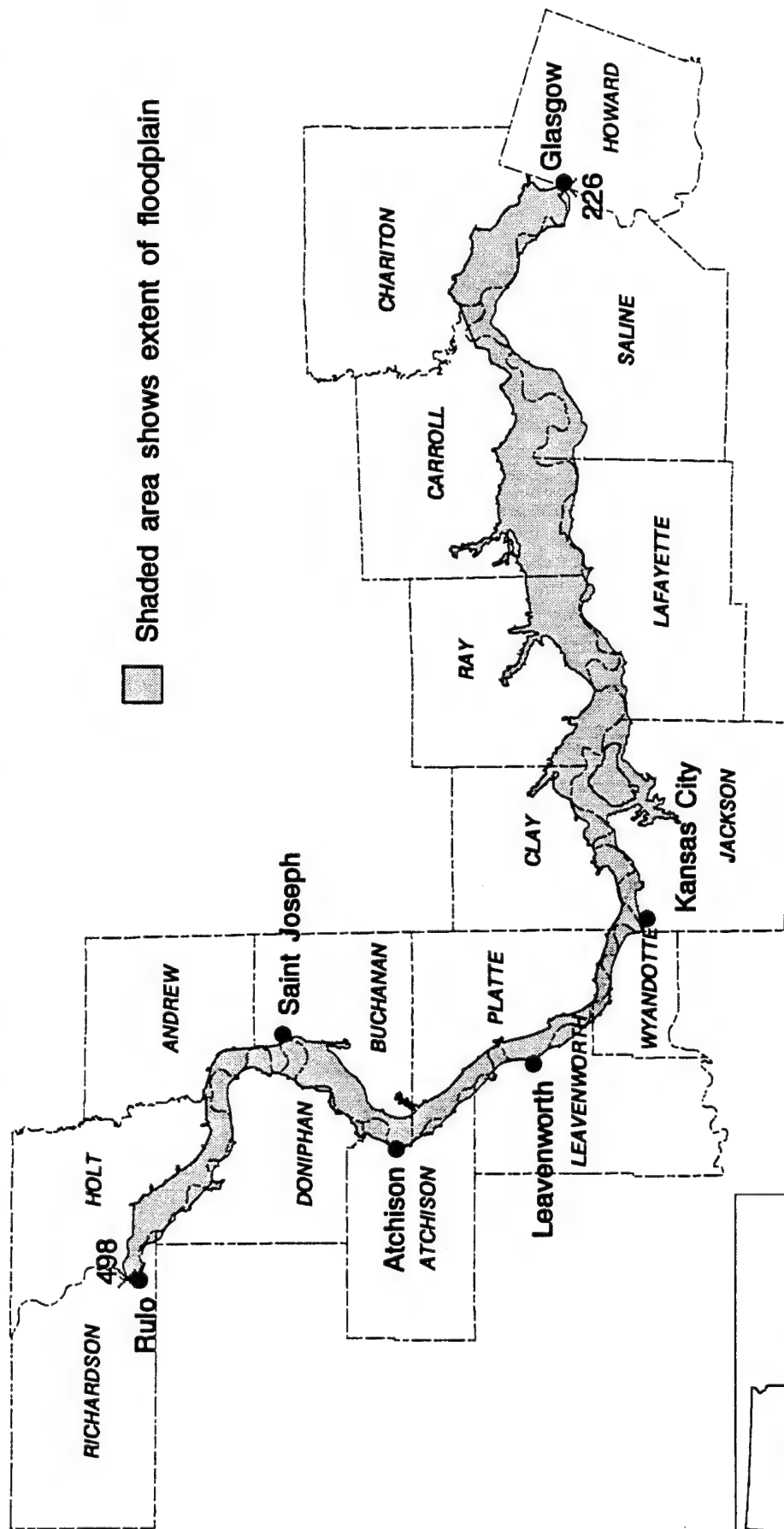
U.S. Fish and Wildlife Service. 1978. *Stream Evaluation Map, State of Nebraska*. Denver, CO.

3.11 MISSOURI RIVER: RULO, NEBRASKA TO GLASGOW, MISSOURI

This study reach begins at Rulo, Nebraska (RM 498), and ends at Glasgow, Missouri (RM 226), (see Figure 3-11). It is approximately 272 river miles in length and is in three states, with four counties in Kansas, twelve counties in Missouri, and one in Nebraska. St. Joseph and Kansas City, Missouri are the major communities along the Missouri bank. Atchison, Leavenworth, and Kansas City, Kansas are the major communities on the Kansas bank. The Kansas, Grand, Big Nemaha, and Chariton Rivers are the primary tributaries entering the Missouri River along this reach.

3.11.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.11-1. Descriptions of the state soil associations are provided in Appendix B.



Shaded area shows extent of floodplain

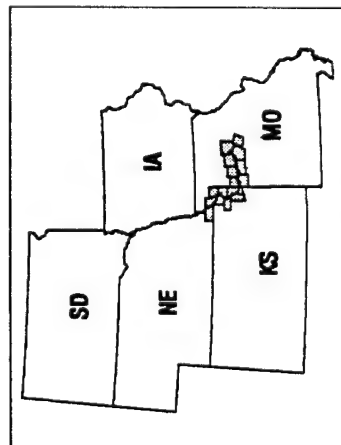


Figure 3-11
Missouri River: Rulo,
Nebraska to Glasgow, Missouri

Table 3.11-1

**SOIL ASSOCIATIONS
MISSOURI RIVER: RULO - GLASGOW**

Soil Association	State	Occurrences	Acres	Percent
ALBATON-ONAWA-HAYNIE	MO	1	23,560	4
LUTON-SALIX-KEG	MO	2	19,290	3
ALBATON-ONAWA-HAYNIE	NE	1	280	<1
MONONA-IDA-NAPIER	MO	4	1,110	<1
IDA-MONONA-NAPIER	NE	3	450	<1
IDA-MONONA-NAPIER	KS	2	770	<1
HAYNIE-LETA-WALDRON	KS	8	44,890	8
KNOX-HIGGINSVILLE-SIBLEY	MO	106	38,280	7
HAYNIE-LETA-WALDRON	MO	23	319,700	54
NODAWAY-COLO-ZOOK	MO	7	20,250	3
WABASH-READING-KENNEBEC	KS	1	510	<1
HAMBURG-MONONA-HAYNIE	KS	5	950	<1
MONONA-MARSHALL-HAMBURG	KS	6	260	<1
KNOX-MORRILL-ARMSTER	KS	18	1,040	<1
MARSHALL-EXIRA-SHELBY	MO	2	130	<1
CARLOW-DOCKERY-FATIMA	MO	1	26,640	5
GRUNDY-LAGONDA-LAMONI	MO	17	2,530	<1
SHARPSBURG-SHELBY-ARMSTER	KS	2	390	<1
BREMER-COTTER-BOOKER	MO	1	72,670	12
KNOX-HIGGINSVILLE-SIBLEY	KS	7	1,500	<1
SHARPSBURG-MACKSBURG-HIGGINSVILLE	MO	2	20	<1
MACKSBURG-MARSHALL-GRUNDY	MO	1	80	<1
ARMSTER-SNEAD-LADOGA	MO	1	220	<1
MONONA-JOY-WINTERSET	MO	3	310	<1
DOCKERY-ZOOK-BLACKOAR	MO	2	10,200	2
SAMPSEL-POLO-SNEAD	MO	7	1,650	<1
SOIL ASSOCIATIONS SUB TOTAL	--	233	587,680	100
UNCLASSIFIED AQUATIC	ALL	18	42,310	--
SOILS AND AQUATIC TOTAL	--	--	629,990	--

3.11.2 Land Use/Land Cover

3.11.2.1 Land Use

The total area of the floodplain of this reach is approximately 630,000 acres (Table 3.11-2). The floodplain is a consistent width of approximately three miles from Rulo, Nebraska to Kansas City. The edge of the floodplain is defined by steep bluffs. East of Kansas City the floodplain widens considerably where the terrain rises more gradually. The river meanders from one side of the floodplain to the other from Rulo to Kansas City. East of Kansas City the floodplain spreads primarily along the left descending bank of the river.

Table 3.11-2

LAND USE/LAND COVER MISSOURI RIVER: RULO - GLASGOW

Cover Type	Acres	Percent
Urban	26,700	4
Agriculture	516,700	82
Range	5,570	1
Upland Forest	4,830	1
Forested Wetland	26,200	4
Non-Forested Wetland	13,020	2
Water	33,970	5
Barren	0	--
Total	629,990	100

While the river runs through the center of the Kansas City metropolitan area, and nearby numerous smaller communities as well, agriculture is still the predominant land use within this reach. Railroad tracks follow the left descending bank of the river for the entire reach.

3.11.2.2 Vegetation

This reach is in an area that once supported tall grass prairie. Big and little bluestem, Indiangrass, porcupinegrass, sideoats grama, and switchgrass were the major native species (SCS, 1981).

Narrow, sparse bands of forest are scattered consistently along the floodplain from Kansas City north, with a few more occurring east of Kansas City. Most of these patches of forest are between the river and the levees. Primary species on the bottomland include cottonwood, American elm, honey locust, sycamore, black walnut, green ash, elder, oak, and maple.

3.11.2.3 Plant Species of Special Concern

Twelve plant species of special concern are found in this reach (Table 3.11-2a). Eleven of the twelve species are listed as endangered in Missouri and one is listed as a rare species by the state of Missouri. None of the species have Federal protection. Nine of the species are found in Platte County.

There are no species of special concern listed for Kansas or Nebraska.

Table 3.11-2a

**PROTECTED PLANT SPECIES OF THE MISSOURI RIVER
RULO - GLASGOW**

Species	Federal Status	Missouri Status	Kansas Status	Nebraska Status	Site Occurrences by County
A Bulrush	--	E	--	--	Platte
Bergia	--	E	--	--	Platte Ray
Cut-leaved Water-Parsnip	--	E	--	--	Platte
Floating Foxtail Grass	--	R	--	--	Clay
Lake-Bank Sedge	--	E	--	--	Clay
Many-Headed Sedge	--	E	--	--	Platte
Marsh Skullcap	--	E	--	--	Saline (2)
Purple Spikerush	--	E	--	--	Platte
Rocky Mountain Bulrush	--	E	--	--	Platte
Sedge	--	E	--	--	Platte
Spike Rush	--	E	--	--	Platte
Texas Bergia	--	E	--	--	Platte

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

3.11.3 Aquatic Resources

3.11.3.1 Wetlands

Along the Missouri River within this study reach, approximately 60,020 acres of vegetated wetland are in the adjacent floodplain. The majority are classified as forested wetland (Table 3.11-3).

Table 3.11-3

AQUATIC RESOURCES¹
MISSOURI RIVER: RULO - GLASGOW

Wetland Class	Acres	Percent
Forested	29,200	49
Shrub/Scrub	2,450	4
Emergent	27,980	47
Water Resources	Acres	Number
Lakes & Ponds	4,790	131

¹Extrapolated from 83 percent coverage.

Vegetated wetlands are evenly distributed along the river segment. Wetlands occur to some extent along most of this river segment. For the most part, wetlands exist as small isolated ecosystems. This is primarily due to the large amount of agricultural land within the Missouri River floodplain.

Areas of both wooded and emergent wetlands are present at the north end of Big Lake east of Rulo, Nebraska. Further east of Rulo, a very large area of wetlands is included in the Squaw Creek National Wildlife Refuge. Several areas of forested wetland are east and southeast of Rulo. These areas are along the east side of the Missouri River between RM 500 and RM 495.

Several wetland areas are between Rulo, Nebraska and St. Joseph, Missouri. Between RM 474 and RM 466 several areas of forested wetlands are along the north side of the river. Wooded areas are also along the south side of this river section. Emergent wetlands are north of the river near RM 467.

North of St. Joseph, Missouri several wetland areas are between RM 459 and RM 457. These wetlands surround an oxbow lake near the left river bank. The wetlands are within the Worthwine Island Wildlife Area.

Wetland areas surrounding a series of several small ponds and mud flats are along the left descending river bank between RM 447 and RM 442. Along the right descending river bank wetlands associated with small ponds and mud flats are found between RM 443 and RM 429. Wetlands are also east of RM 430.

Near RM 338, several wetland areas surround an island and oxbow lake on the north side of the Missouri River; near the confluence of the Little Blue River. These wetlands are mainly forested.

Several small wetland areas are south of Carrollton, Missouri. These wetlands are associated with several small streams and ponds within the Missouri River floodplain; agricultural land surrounds many of these wetlands. The largest wetland areas are west of RM 288, surrounding Cranberry Chute, and along the right descending bank between RM 284 and RM 280.

North of Marshall, Missouri several wetland areas are near Van Meter State Park. Between RM 272 and RM 267 several areas of forested wetlands are within the Grand Pass Wildlife Area. These wetlands continue east along the Missouri River. Several wetland areas are also along the Van Meter Drainage Ditch.

Several wetland areas are south of Brunswick, Missouri. Between RM 258 and RM 253 several wooded wetlands areas are inside a river bend. Areas of forested and emergent wetlands surround two small ponds north of RM 249. Several wetland areas are also near Cut-Off Lake.

3.11.3.2 Lakes and Ponds

Approximately 131 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 4,790 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is approximately 37 acres. These figures include water bodies such as oxbow lakes. Following is a list of the largest lakes and their locations:

Lake	Location	River Mile
Browning Lake	W. of St. Joseph, MO	451
Lake Contrary	W. of St. Joseph, MO	443
Horseshoe Lake	W. of St. Joseph, MO	437
Mud Lake	W. of St. Joseph, MO	436
Lewis and Clark Lake	Atchison, KS	419
Bean Lake	S.E. of Atchison, KS	416
Mud Lake	E. of Leavenworth, KS	398
Cooley Lake	E. of Liberty, MO	342
Sunshine Lake	W. of Lexington, MO	324
Hicklin Lake	E. of Lexington, MO	310
Cut-Off Lake	S.E. of Brunswick, MO	247

West of St. Joseph, Missouri several ponds and oxbow lakes have associated wetland areas. These lakes include Browning Lake, Lake Contrary, Horseshoe Lake, and Old and New Mud Lakes. Wetlands generally extend from the ends of these oxbow lakes, following the old river channel. Many small ponds are also present in this area, especially along the river banks.

Several small ponds are also near Sunshine Lake. These ponds and Sunshine Lake all have small areas of associated wetlands.

Several wetland areas are near Atchison, Kansas. North of Lewis and Clark Lake, several areas of emergent wetlands are present around Mud Lake. Wetlands are also near Bean Lake and Little Bean Lake. The wetlands surrounding Little Bean Lake are partially included in the Little Bean Marsh Conservation Area. Near RM 411 emergent wetlands are present in the area of Wellson Slough.

Several areas of forested and emergent wetlands surround Cut-Off Lake and several small lakes and ponds near this lake. These wetlands are mainly around the north end of Cut-Off Lake, around the smaller lakes in this area, and along Palmer Creek which drains from Cut-Off Lake.

3.11.3.3 Tributaries

Numerous tributaries empty into the Missouri River within this particular segment. Many of these are small perennial to intermittent streams. Some of the streams that empty into the Missouri River are listed below:

Tributary	Confluence Location	River Mile
Big Nemaha River	S. of Rulo, NE	495
Wolf River	N.W. of St. Joseph, MO	479
Nodaway River	W. of St. Joseph, MO	463
Platte River	S. of Leavenworth, KS	391
Kansas River	Kansas City, KS	367
Blue River	Independence, MO	357
Little Blue River	E. of Liberty, MO	339
Fishing River	W. of Lexington, MO	334
Crooked River	N. of Lexington, MO	314
Grand River	S. of Brunswick, MO	250
Chariton River	W. of Glasgow, MO	239
Little Chariton River	Glasgow, MO	227

Areas of both emergent and forested wetlands are present at the confluence of the Nodaway and Missouri Rivers. Forested wetlands are also along the right descending bank of the Missouri River in this location.

Several areas of emergent and forested wetlands are at the confluence of the Little Blue and Missouri Rivers. Much of these wetlands are contained within the mouth of the Little Blue Park. These wetlands continue upstream along the right descending bank of the Missouri River.

Wetland areas are along the Grand River as it passes through the Missouri River floodplain. These wetlands are associated with numerous ponds, oxbow lakes, and islands found along the Grand River. More detailed information on the Grand River is provided in Section 3.13.

Wetlands are also along the Chariton River within the Missouri River floodplain. Several areas of forested wetlands are west of the current location of the Chariton River surrounding a small oxbow lake. The Chariton River has been diverted away from the original river channel, and the Old Channel of the Chariton River now forms a narrow lake that is over 20 miles long. Several forested areas are along this old river channel.

3.11.4 Fisheries

The Missouri River between Rulo, Nebraska and Glasgow, Missouri supports a diversity of fish species. Ninety-one fish species have been reported from the mainstem Missouri River (Grace and Pflieger, 1989). According to Hesse et al. (1988), at least 156 naturally occurring species have been captured in the Missouri River at some time.

Major game species in this reach include white bass, bluegill, crappie, channel and flathead catfish (Hesse et. al 1988, Galat et. al, 1994). Minor species include largemouth bass, walleye, and sauger (Fleener, 1989). Carp, buffalo, and catfishes dominated the commercial fishery in 1992. In that year, over 100,000 pounds of fish were commercially harvested from this reach in Missouri (Robinson, 1994).

3.11.4.1 Aquatic Species of Special Concern

Seven protected aquatic species are found in this reach (Table 3.11-4). The pallid sturgeon is the only species with Federal protection under the Endangered Species Act. The remainder of the protected species found in this reach are listed as threatened, rare or endangered by at least one of the states of Missouri, Kansas and Nebraska.

According to the Kansas Department of Wildlife and Parks, critical habitat for the flathead chub, pallid sturgeon, sicklefin chub, and silverband shiner has been designated in all the Kansas counties bordering this reach. Critical habitat for the chestnut lamprey has been designated in Wyandotte, Atchison, and Doniphan Counties in Kansas. Critical habitat has been designated for the western silvery minnow in every Kansas county bordering this reach except for Doniphan County. Critical habitat for the sturgeon chub has been designated in Doniphan, Wyandotte, and Leavenworth Counties in Kansas; Kansas Administrative Regulation 115-5-3. The Kansas critical habitat definition is separate from the Federal critical habitat definition as contained in the Endangered Species Act of 1973.

Table 3.11-4

**PROTECTED AQUATIC SPECIES IN THE MISSOURI RIVER
RULO - GLASGOW**

Species	Federal Status	Missouri Status	Kansas Status	Nebraska Status	Site Occurrences by County
Brassy Minnow	--	R	--	--	Buchanan, Platte
Flathead Chub	--	E	T	--	Andrew, Doniphan, Leavenworth
Lake Sturgeon	--	E	--	T	Carroll
Pallid Sturgeon	E	--	E	E	Doniphan(2), Leavenworth
Sicklefin Chub	--	R	E	--	Andrew(2), Buchanan(2), Chariton, Saline, Doniphan
Sturgeon Chub	--	R	T	--	Andrew(2), Chariton, Platte(2), Leavenworth
Western Silvery Minnow	--	--	T	--	Leavenworth

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

3.11.4.2 Important Aquatic Habitat

Major tributaries such as the Kansas, Grand and Nemaha Rivers provide important spawning and rearing habitat for both the pallid and lake sturgeons and other species. Numerous revetments and dikes scattered throughout this reach provide important habitat for catfish, crappie, and other species (USCOE, 1993). Abandoned channels, oxbow lakes, and chutes throughout this reach provide important habitat for crappie, white bass, and catfish.

3.11.5 Wildlife

Major wildlife species occurring along this reach include white-tailed deer, bobwhite quail, wild turkey, cottontail rabbit, and ring-necked pheasant (limited to the upper portions of this reach). Numerous furbearing mammals such as beaver, mink, coyote, raccoon, and muskrat are common throughout this reach.

This reach of the Missouri River provides important habitat for migrating waterfowl. Major waterfowl species include mallard, wood duck, northern shoveler, pintail, blue-winged teal, green-winged teal, and widgeon. Snow and Canada geese are also common along this reach. Bald eagles occur along this reach. An active bald eagle nest is in Carroll County, Missouri (McNulty, 1994).

3.11.5.1 Wildlife Species of Special Concern

Eight protected wildlife species occur along this reach (Table 3.11-5). All of these species are birds. The peregrine falcon and the bald eagle are the only species with Federal protection. The remainder of the protected species are listed as rare or endangered by the states of Missouri, Kansas or Nebraska.

Table 3.11-5

PROTECTED WILDLIFE SPECIES OF THE MISSOURI RIVER RULO - GLASGOW

Species	Federal Status	Missouri Status	Kansas Status	Nebraska Status	Site Occurrences by County
American Bittern	--	E	--	--	LaFayette, Saline
Bald Eagle	E	E	E	E	Carroll
Great Egret	--	R	--	--	Ray
Greater Prairie-Chicken	--	R	--	--	Carroll
King Rail	--	E	--	--	Saline
Peregrine Falcon	E	E	E	E	Holt
Pied-Billed Grebe	--	R	--	--	Buchanan, Carroll, LaFayette, Ray, Saline
Yellow-Headed Blackbird	--	R	--	--	Buchanan, Platte(3), Saline

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

3.11.5.2 Important Wildlife Habitat

A diversity of wildlife habitat occurs throughout this reach. Nineteen different wildlife management areas provide important habitat for a variety of wildlife species. The Bob Brown Wildlife Area in Holt County, Missouri provides important habitat for American bitterns, bald eagles, great egrets, ring-necked pheasants, and king rails. The Grand Pass Wildlife Area in Saline County, Missouri also provides important habitat for migrating waterfowl. The Squaw Creek National Wildlife Refuge provides 6,900 acres of habitat for a diversity of wildlife species. Bald eagles are common during their migration and snow geese have been known to number up to 400,000 at times.

In addition to the WMASs, Sunshine Lake in Ray County provides important habitat for migrating waterfowl and bald eagles. In Carroll County, Missouri south of Carrollton a small forested area provides important nesting habitat for bald eagles.

3.11.6 Fish and Wildlife Management Areas

This study reach contains 19 major FWMAs of which all but two are within Missouri. Squaw Creek is the only National Wildlife Refuge. Protected species that use the refuge include the Federally-endangered bald eagle and peregrine falcon. The 19 management areas by state are listed in Table 3.11-6; the acreage of each is also provided.

Table 3.11-6

FISH AND WILDLIFE MANAGEMENT AREAS RULO - GLASGOW

Management Areas	State	County	Type	Acres
McKinney Conservation Area	MO	Carroll	S	120
W.L. Schifferdecker Memorial Conservation Area	MO	Carroll	S	241
Ray County City Lake	MO	Ray	L	159
Cooley Lake Wildlife Management Area	MO	Clay	S	916
Little Bean Marsh Conservation Area	MO	Platte	S	427
Bluffwoods Wildlife Area	MO	Buchanan	S	2,281
Bluffwoods - Goodell Memorial Annex	MO	Buchanan	S	63
Kneib (W.V. & A.C.) Memorial Conservation Area	MO	Buchanan	S	40
Caroline Sheridan Logan Memorial Conservation Area	MO	Buchanan	S	40
Worthwine Island Conservation Area	MO	Andrew	S	430
Monkey Mountain Wildlife Area	MO	Holt	S	787
Bob Brown Wildlife Area	MO	Holt	S	3,302
Jamerson C. McCormack Wildlife Area	MO	Holt	S	227
Squaw Creek National Wildlife Refuge	MO	Holt	F	6,900
Grand Pass Wildlife Area	MO	Saline	S	4,711
Baltimore Bend Conservation Area	MO	Lafayette	S	1,102
Burr Oak Woods Wildlife Area	MO	Jackson	S	1,072
Benedictine Bottoms	KS	Atchison	F	2,100
Theodore Granville Barcus Wildlife Area	KS	Wyandotte, Leavenworth	S	48
Total Identified Acreage	--	--	--	24,966

Type: Federal (F), State (S), Local (L)

ND = No Data

Squaw Creek National Wildlife Refuge, southwest of Mound City in Holt County, Missouri, is the largest FWMA in the study reach and the only Federal management area. A portion of the refuge is

within this study reach. Established in 1935, the refuge provides habitat for many different species, including the red bat, woodchuck, beaver, plains pocket gopher, and gray and red fox. The Squaw Creek Area contains four large lakes within marshlands and provides fishing and hunting opportunities, observation towers, and foot trails. The site provides habitat for hundreds of wintering bald eagles and many migrating geese and ducks. Over 367 different species of birds, mammals, reptiles, and amphibians are within this refuge (USFWS, 1992).

Grand Pass Wildlife Area is southwest of the town of Miami in Saline County, Missouri. This management area contains two lakes (the largest of which is 7 acres) and provides opportunities for hunting turkey and deer; fishing; and boating. The Bob Brown Wildlife Area is west of Forest City in Holt County, Missouri. Hunting, fishing, boating, camping, and hiking facilities are available.

Bluffwoods Wildlife Area, north of De Kalb in Buchanan County, Missouri, offers hunting opportunities for small game, deer, and turkey. Other recreational opportunities available include fishing, camping, hiking, and horseback riding. Just north of the Bluffwoods Wildlife Area is the Bluffwoods - Goodell Memorial Annex, a 63-acre FWMA. Hunting and camping opportunities are available at this FWMA.

Baltimore Bend Conservation Area, west of Waverly in Lafayette County, Missouri, consists of two small lakes, the largest of which is three acres. Hunting, fishing, and boating are popular activities.

The USCOE recently acquired Benedictine Bottoms as a wildlife habitat mitigation area. It is in Atchison County, Kansas and contains 2,100 acres.

The other FWMA found in Kansas is the 48-acre Theodore Granville Barcus Wildlife Area. The area lies in both Wyandotte and Leavenworth counties near the town of Wolcott.

3.11.7 Natural Areas

This study reach includes four natural areas totalling 631 acres. Habitats include bottomland and upland forest, marsh, sloughs, old growth forest, bluff prairie, and significant geologic features. The areas are listed in Table 3.11-7 by state, county, management, and acreage.

Table 3.11-7

NATURAL AREAS
MISSOURI RIVER: RULO - GLASGOW

Natural Areas	State	County	Type	Acres
Rulo Bluffs Preserve	NE	Richardson	P	444
Little Bean Marsh Natural Area	MO	Platte	S	151
Hidden Valley Natural Area	MO	Clay	S	82
Van Meter Forest Natural Area	MO	Saline	S	114
Total Identified Acreage	--	--	--	791

Type: Federal (F), State (S), Private (P) ND = No Data

Rulo Bluffs is the only area listed in Nebraska. Located in the southeastern corner of the state, the area features loess hill prairies and mature hardwood forest. Loess is silt which was blown from the floodplain some 20,000 years ago. In this area, mature eastern hardwood forest meets western prairie. The Nature Conservancy owns the area and recently added 160 acres. Proposed expansion includes acquisition of 1,500 acres (Nature Conservancy, 1994; Steinauer, 1994).

Three of the natural areas are in Missouri. Little Bean Marsh Natural History Area lies between Kansas City and St. Joseph. The area features a natural Missouri River marsh, a slough and bottomland floodplain forest. This is an excellent wintering area for bald eagles and hawk species. The area is used by many migratory bird species and provides breeding habitat for marsh wildlife. The Hidden Valley Natural Area is within Hidden Valley Park in North Kansas City. The area features rugged hills vegetated by upland forest on deep loess soils.

Van Meter Forest Natural Area within Van Meter State Park, has significant geologic and botanical features. Geologic features include serrated ridges of loess called the Pinnacles. Devils Backbone is an unusual ridge in the southern area of the Pinnacles. Old growth forest is found in ravine pockets (Thom and Iffrig, 1985). A 76-acre old-growth mesic forest is considered among the highest quality forests in the Glaciated Plains Natural Division. A 38-acre high quality dry-mesic forest is found on loess hill ridgetops. A state-listed snail (status unknown) is found here; although it may not be within the limits of the floodplain. Also, a state champion tree (the largest specimen in the state) is found here (Thom and Iffrig, 1985; Kramer, 1993).

3.11.8 Recreation Areas

This study reach contains 14 major recreation areas, with the majority in Missouri. State parks and forests account for six of the 14 recreation areas; with the remaining 8 recreation areas are locally-controlled. All of the state-owned recreation areas are within Missouri. No Federal recreation areas occur within this study reach. Camping, picnicking, hunting/fishing, hiking/biking, and water activities are recreational opportunities available along this study reach. The 14 recreation areas and the activities which they provide are listed in Table 3.11-8.

Table 3.11-8

RECREATION AREAS
MISSOURI RIVER: RULO - GLASGOW

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Big Lake State Park	MO	Holt	407	S	X	X	X	--	X*
Riverbreaks State Forest	MO	Holt	2,307	S	X	--	X	X	--
Nodaway Island Park	MO	Andrew	19	L	ND	ND	ND	ND	ND
Lewis & Clark State Park	MO	Buchanan	121	S	X	X	X	--	X*
Weston Bend State Park	MO	Platte	1,024	S	--	X	--	X	--
Lexington State Park	MO	Lafayette	106	S	--	--	--	--	--
Van Meter State Park	MO	Saline	983	S	X	X	X	X	X*
Miami River Front Park	MO	Saline	26	L	ND	ND	ND	ND	ND
English Landing Park	MO	Jackson	11	L	ND	ND	ND	ND	ND
Riverfront Park	MO	Jackson	955	L	ND	ND	ND	ND	ND
LaBenite Park	MO	Jackson	228	L	ND	ND	ND	ND	ND
Mouth of the Little Blue Park	MO	Jackson	264	L	ND	ND	ND	ND	ND
Jackson Park	KS	Atchison	118	L	ND	ND	ND	ND	ND
River Front Park	KS	Leavenworth	3	L	ND	ND	ND	ND	ND
Total Identified Acreage	--	--	6,572	--	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

Riverbreaks State Forest is the largest recreation area within this study reach. Situated southeast of the town of Oregon in Holt County, Missouri, the forest contains three lakes (the largest of which is ten acres) and provides opportunities for hunting, fishing, and camping.

Weston Bend State Park, south of Weston, was established in 1837 near Fort Leavenworth. The landscape of this park is filled with mature hardwoods. Recreational opportunities at the park include camping, hiking, biking, and picnicking (Missouri DNR, 1991).

Van Meter State Park, northwest of Marshall in Saline County, Missouri, offers camping, hiking, a day-use area, and a visitor's center. Within the park are several interesting features, including the 18-acre Lake Wooldridge, Old Fort, Mound Field, nature trails, and a 40-acre natural marsh (Missouri DNR, 1990b).

Big Lake State Park is adjacent to the 625-acre Big Lake, a large oxbow lake, southwest of Mound City in Holt County, Missouri. Many different species of birds migrate through this park, including American white pelicans, great blue herons, pintails, teals, snow geese, mallards, Canada geese, and cormorants. Big Lake State Park was established in 1932, approximately eight miles from the Squaw Creek National Wildlife Refuge. Recreation opportunities include camping, boating, and fishing for catfish, carp, crappie, bass, and bluegill (Missouri DNR, 1992).

Lewis and Clark State Park, one of the smallest parks in the state park system, is southwest of St. Joseph in Buchanan County, Missouri. The 121-acre park borders Sugar Lake and the Lewis and Clark Fish Hatchery. Camping, fishing, picnicking, boating, and swimming are activities available at this park (Missouri DNR, 1990a).

Battle of Lexington State Park is a park and historic site in Lexington, Missouri. The park offers a tour of the Anderson-Davis House and a mile long trail through the Battlefield.

3.11.9 Data Gaps

The NWI data covered only 83 percent of the reach. The data was extrapolated proportionately to provide total acreage for each wetlands class.

3.11.10 References Cited

Fleener, G.C. 1989. *Recreational Use Survey of the Missouri River*. Dingell Johnson Project F-1-R-38. Study S-32. Missouri Department of Conservation. Jefferson City, MO.

Galat, D.L., Robinson, J.W. and Hesse, L.W. 1994. *Restoring Aquatic Resources to the Lower Missouri River: Issues and Initiatives*. Missouri Cooperative Fish and Wildlife Research Unit. Columbia, MO.

Grace, T.B. and Pflieger, W.L. 1989. *Common and Scientific Names of Fishes of the Missouri River*. Unpublished Report of the Missouri Department of Conservation, Columbia, MO.

Hesse, L.W., Wolfe, L.W. and Cole, N.K. 1988. *Some Aspects of Energy Flow in the Missouri River Ecosystem and a Rationale for Recovery in N.G. Benson (ed)*, The Missouri River: The Resources, Their Uses and Values. North Central Division, American Fish Society Special Publication No. 8.

Kramer, K. 1993. *Missouri Natural Features Inventory: Andrew, Atchison, Gentry, Holt, Nodaway and Worth Counties*. Jefferson City, MO.

McNulty, B. 1994. *Telephone Conversation*. U.S. Army Corps of Engineers.

Missouri Department of Natural Resources. 1990a. *Lewis and Clark State Park*. Jefferson City, MO.

Missouri Department of Natural Resources. 1990b. *Van Meter State Park*. Jefferson City, MO.

Missouri Department of Natural Resources. 1991. *Weston Bend State Park*. Jefferson City, MO.

Missouri Department of Natural Resources. 1992. *Big Lake State Park*. Jefferson City, MO.

Nature Conservancy. 1994. *Nebraska Chapter Newsletter*. Lincoln, NE.

Robinson, J.W. 1994. *Missouri Commercial Fishery Harvest, 1992*. Missouri Department of Conservation. Columbia, MO.

Floodplain Management Assessment

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

Steinauer, G. 1994. *Telephone Conversation*. Nebraska Game & Parks Commission. Lincoln, NE.

Thom, R.H. and Iffrig, B. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.

U.S. Army Corps of Engineers. 1993. *Missouri River Master Water Control Manual: Review and Update Study*. Volume 7F: Environmental Studies.

U.S. Fish and Wildlife Service. 1992. *Squaw Creek National Wildlife Refuge*.

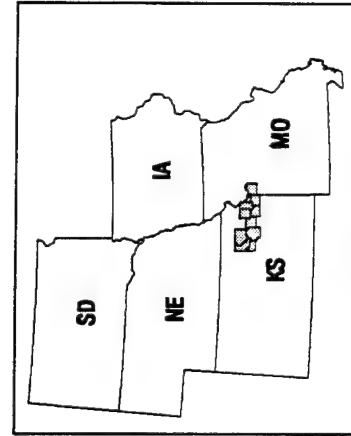
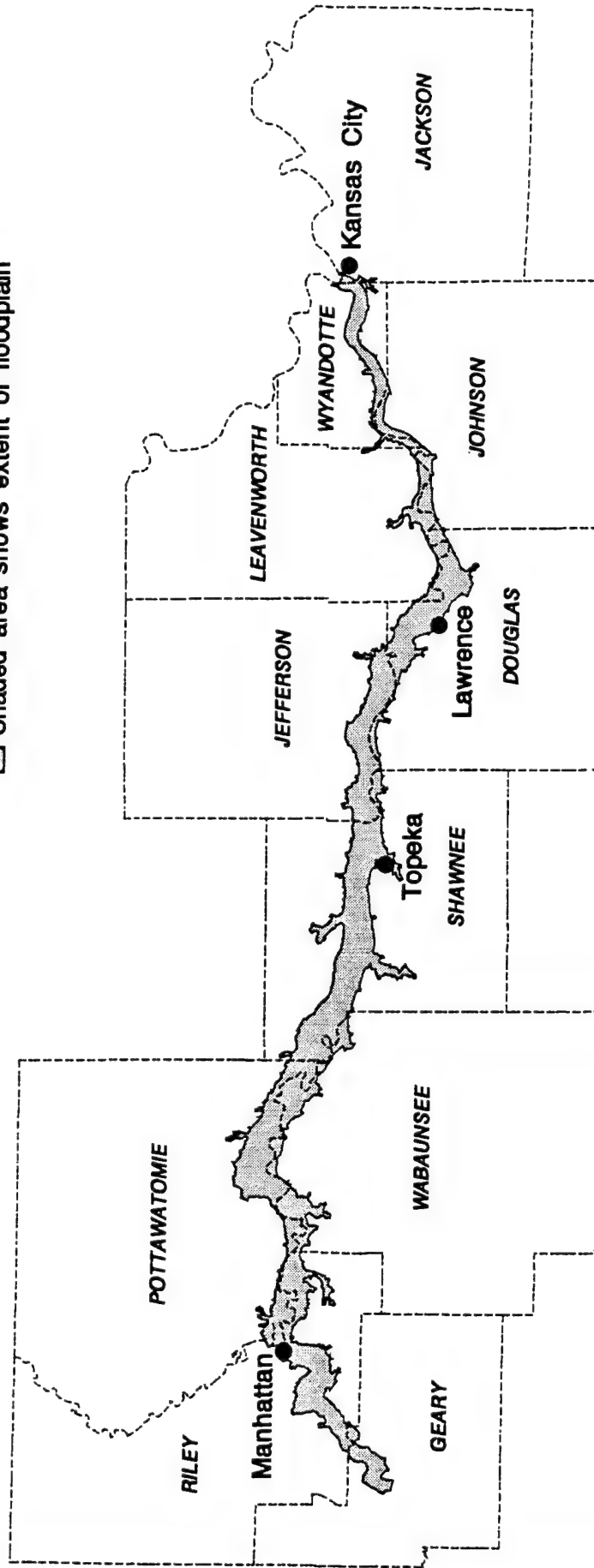
3.12 KANSAS RIVER

This study reach includes part of the Kansas River, beginning at the confluence of the Republican River (see Figure 3-12). The study reach continues downstream through ten counties in Kansas, and one in Missouri, terminating at the confluence with the Missouri River. It is approximately 170 river miles in length. Kansas City, Lawrence, and Topeka, Kansas are the major communities along this reach. The Delaware, Big Blue and Wakarusa Rivers are the primary tributaries entering the Kansas River along this reach.

3.12.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.12-1. Descriptions of the state soil associations are provided in Appendix B.

■ Shaded area shows extent of floodplain



Key Map



Figure 3-12

Kansas River

Table 3.12-1

**SOIL ASSOCIATIONS
KANSAS RIVER**

Soil Association	State	Occurrences	Acres	Percent
BENFIELD-CLIME-TULLY	KS	11	2,380	1
CHASE-WABASH-KENNEBEC	KS	1	2,530	1
PAWNEE-WYMORE-KENNEBEC	KS	6	90	<1
EUDORA-HAYNIE-MUIR	KS	1	125,710	53
MORRILL-ORTELLO-THURMAN	KS	4	690	<1
WAMEGO-ELMONT-KENNEBEC	KS	4	30	<1
SMOLAN-GEARY-KENNEBEC	KS	4	820	<1
CLIME-SOGN-MARTIN	KS	30	4,840	2
KIPSON-CRETE-PAWNEE	KS	1	330	<1
WABASH-READING-KENNEBEC	KS	11	32,470	14
READING-IVAN-CHASE	KS	2	1,530	<1
PAWNEE-MARTIN-SOGN	KS	14	750	<1
GYMER-MORRILL-SHARPSBURG	KS	19	670	<1
IRWIN-LADYSMITH-LABETTE	KS	2	200	<1
HAYNIE-LETA-WALDRON	KS	1	4,170	2
HAYNIE-LETA-WALDRON	MO	1	470	<1
KNOX-HIGGINSVILLE-SIBLEY	MO	2	320	<1
EUDORA-KIMO-SARPY	KS	1	52,070	22
VINLAND-MARTIN-OSKA	KS	24	1,510	<1
MARTIN-WAMEGO-ELMONT	KS	13	1,370	<1
KNOX-HIGGINSVILLE-SIBLEY	KS	12	910	<1
GOSPORT-SOGN-LADOGA	KS	3	390	<1
FLORENCE-LABETTE-TULLY	KS	4	710	<1
WELDA-KAMIE-ARMSTER	KS	7	440	<1
SHARPSBURG-MACKSBURG-CLARINDA	KS	6	220	<1
ELMONT-MARTIN-VINLAND	KS	5	90	<1
MARTIN-LABETTE-PAWNEE	KS	2	340	<1
MARTIN-GRUNDY-ELMONT	KS	2	70	<1
MARTIN-LADYSMITH-LABETTE	KS	1	10	<1
WOODSON-PAWNEE-MORRILL	KS	7	590	<1
BATES-WOODSON-SUMMIT	KS	4	370	<1
SOIL ASSOCIATIONS SUB TOTAL	—	205	237,090	100
UNCLASSIFIED AQUATIC	ALL	—	—	--
SOILS AND AQUATIC TOTAL	--	—	237,090	--

3.12.2 Land Use/Land Cover

3.12.2.1 Land Use

The total area of the floodplain covers 237,090 acres within this reach (Table 3.12-2). The river is wide west of Topeka, narrowing between Lawrence and Kansas City.

Urban areas along this reach include Lawrence, Topeka, Manhattan and Junction City, Kansas and the Kansas City metropolitan area. Railroad lines run the entire length along the left descending bank.

Table 3.12-2

LAND USE/LAND COVER KANSAS RIVER

Cover Type	Acres	Percent
Urban	30,500	13
Agriculture	150,130	63
Range	18,560	8
Upland Forest	7,550	3
Wetland*	17,160	7
Water	12,360	5
Barren	830	< 1
Total	237,090	100

*No NWI data available for forested wetland.

3.12.2.2 Vegetation

Scattered areas of forest are throughout the reach. The forested areas are sparser towards the western end of the reach. Cottonwoods, American elm, honey locust, sycamore, and black locusts are the major species found in the bottomlands. Upland tree species found within the reach include basswood, red, white and bur oaks, shagbark hickory and bitternut hickory (SCS, 1981).

Tall grass prairie is the native land cover for much of this reach. Native grasses include big bluestem, little bluestem, switchgrass, Indian grass, sideoats gramma, and western wheatgrass. The majority of the reach is now used for agriculture, mainly cropland (SCS, 1981).

3.12.2.3 Plant Species of Special Concern

No species of special concern were identified within this reach in the database search.

3.12.3 Aquatic Resources

3.12.3.1 Wetlands

No NWI data was available for this study reach. Wetlands were identified by reviewing USGS topographic maps. Based on the land use/land cover data, approximately 17,160 acres of vegetated wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Few islands are within the channel of the Kansas River. Most of the wetlands are directly adjacent to the main river channel or along some of the larger tributaries, lakes, or ponds. For the most part, wetlands exist as small isolated ecosystems. This is primarily due to the large amount of agricultural land within the Kansas River floodplain. A large area of wetlands is south of Manhattan, at the confluence of the Kansas River and several large creeks.

3.12.3.2 Lakes and Ponds

Approximately 45 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 1,090 acres. Most of the water bodies have small surface areas. The average size of each pond or lake is approximately 24 acres. An oxbow lake has formed northwest of Lawrence, called Lake View.

3.12.3.3 Tributaries

Several tributaries empty into the Kansas River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger waterways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Big Blue River	E. of Manhattan
Deep Creek	S.W. of Wamego
Rock Creek	E. of Wamego
Soldier Creek	Topeka
Delaware River	Perry
Wakarusa River	Eudora

3.12.4 Fisheries

The Kansas River between Milford Lake and its confluence with the Missouri River provides a diversity of habitats important to over 50 fish species (Hartmann, 1980). Common game species occurring in this reach include white bass, and channel and flathead catfish (Taber, 1994). Minor species include walleye, sauger, and shovelnose sturgeon. Carp, drum, and smallmouth buffalo are the major roughfish species occurring in this reach.

3.12.4.1 Aquatic Species of Special Concern

Four protected fish species are in this reach (Table 3.12-4). The pallid sturgeon is the only species with Federal protection under the Endangered Species Act. The remainder of the protected species are listed as threatened or endangered by the state of Kansas. The sturgeon chub is present in three

of the eleven counties in this reach. The pallid sturgeon is known to occur in Douglas and Leavenworth Counties.

According to Kansas Department of Wildlife and Parks, the state has designated critical habitat for ten different species in the counties surrounding this reach. Critical habitat for the bald eagle occurs in every county. Critical habitat for the sturgeon chub occurs in every county but Wabaunsee. Critical habitat for the flathead chub has been designated in Wyandotte, Johnson, Leavenworth, Douglas, and Jefferson Counties. Wyandotte and Leavenworth Counties contain critical habitat for the pallid sturgeon, sicklefin chub, western silvery minnow, and silverband shiner. Critical habitat for the chestnut lamprey also occurs in Wyandotte County. Critical habitat for the blackside darter and hornyhead chub is in Wabaunsee County. The Kansas definition of critical habitat is different from the Federal critical habitat definition contained in the Endangered Species Act of 1973.

Table 3.12-4

**PROTECTED AQUATIC SPECIES
KANSAS RIVER**

Species	Federal Status	Kansas Status	Missouri Status	Site Occurrences by County
Flathead Chub	--	T	--	Douglas, Jefferson
Pallid Sturgeon	E	E	--	Douglas, Leavenworth
Sicklefin Chub	--	E	--	Douglas, Leavenworth
Sturgeon Chub	--	T	--	Douglas, Leavenworth, Wyandotte(2)

E = listed as endangered T = listed as threatened

3.12.4.2 Important Aquatic Habitat

Important habitat for aquatic species occurs in a variety of forms throughout this reach. The Bower Sock Dam near Lawrence in Douglas County provides an important concentration area for all fish species. During normal flow, this dam acts as a barrier to upstream fish migration. The Johnson County weir near the Wyandotte County line also acts as a barrier to fish movement providing another important concentration area for fish. The lower part of the Kansas River provides important habitat for the pallid sturgeon. The tailwaters of Tuttle Creek, Milford and Perry Lakes provide important deepwater habitat for catfish, walleye, and other species (Taber, 1994). Tributaries flowing into the Kansas River provide important nursery areas for all species of fish known from the Kansas River.

3.12.5 Wildlife

The Kansas River corridor provides an important travel and migration corridor for all avian species and represents the largest and widest riparian woodland area in the state of Kansas. White-tailed deer, wild turkey, bobwhite quail, and pheasants are all common throughout this reach. Numerous

species of furbearers including bobcat, red and gray fox, coyote, and raccoon are also prevalent. Major waterfowl species known from this reach include mallard, wood duck, pintail, blue and green-winged teal, widgeon, gadwall, and snow and Canada geese.

3.12.5.1 Wildlife Species of Special Concern

The bald eagle is the only protected wildlife species identified in this reach (Table 3.12-5). It is listed as endangered Federally and endangered by the state of Kansas. Kansas has designated most of this reach as critical habitat for the bald eagle under their program. This critical habitat definition is independent from the Federal Critical Habitat designation contained in the Endangered Species Act of 1973.

Table 3.12-5

PROTECTED WILDLIFE SPECIES KANSAS RIVER

Species	Federal Status	Kansas Status	Site Occurrences by County
Bald Eagle	E	E	All

E = listed as endangered

3.12.5.2 Important Wildlife Habitat

The entire length of the Kansas River in Kansas provides important habitat for the bald eagle. The riparian corridor along the river provides important migrational habitat for neotropical passerines, waterfowl, white-tailed deer, and other species. The mouth of the Kansas River and the tailwaters of Tuttle Creek, Milford and Perry Lakes all provide important fishing habitat for bald eagles. The Jefferson Energy Center in Pottawattamie County provides 6,580 acres of wildlife habitat important to quail, pheasant, deer, prairie chicken, turkey, and waterfowl. This area contains 520 acres of water important to all species of waterfowl during migration.

3.12.6 Fish and Wildlife Management Areas

This study reach contains four major FWMAs, within Shawnee, Pottawattamie, and Riley counties in Kansas. No Federal recreation areas occur within this study reach. The four management areas are listed by state in Table 3.12-6; the acreage of each is also provided.

Table 3.12-6

**FISH AND WILDLIFE MANAGEMENT AREAS
KANSAS RIVER**

Management Areas	State	County	Type	Acres
Topeka Fishing Area	KS	Shawnee	ND	ND
Herbert Reinhard Green Memorial Wildlife Area	KS	Shawnee	S	83
Jefferson Energy Center Wildlife Area	KS	Pottawattomie	ND	6,580
Pillsbury Crossing Fishing Area	KS	Riley	ND	59
Total Identified Acreage	--	--	--	6,722

Type: Federal (F), State (S), Local (L) ND = No Data

Jefferson Energy Center Wildlife Area, Pillsbury Crossing Fishing Area, Herbert Reinhard Green Memorial Wildlife Area, and Topeka Fishing Area are the only FWMAs found along this study reach. The Jefferson Energy Center Wildlife Area is comprised of 6,580 acres of land and 520 acres of water. Acquired in 1987, the management area is near the town of Belvue in Pottawattomie County. Wildlife inhabiting the area include turkey, deer, dove, rabbit, prairie chicken, pheasant, quail, and waterfowl. Pillsbury Crossing Fishing Area is near Zeandale in Riley County, while the Topeka Fishing Area is found within Topeka in Shawnee County.

3.12.7 Natural Areas

Two natural areas were identified within this study reach totalling 86 acres. They are listed in Table 3.12-7.

Table 3.12-7

**NATURAL AREAS
KANSAS RIVER**

Natural Areas	State	County	Type	Acres
Eudora Floodplain Forest	KS	Douglas	P	54
Lorraine's Oak Grove	KS	Douglas	P	32
Total Identified Acreage	--	--	--	86

Type: Federal (F), State (S), Private (P) ND = No Data

Both natural areas occur in Douglas County, Kansas. Eudora Floodplain Forest is a high quality old growth forest. The area has large cottonwood trees and serves as a bald eagle roost. Lorraine's Oak Grove is a small stand of old growth floodplain forest (Freeman, 1994).

3.12.8 Recreation Areas

No recreation areas were identified in this study reach.

3.12.9 Data Gaps

No NWI data was available for this reach. Descriptions of wetlands were based on review of USGS maps. The total acreage for wetlands was taken from the land use/land cover data.

3.12.10 References Cited

Freeman, C. 1994. *Telephone Conversation*. Kansas Biological Survey. Lawrence, Kansas.

Hartmann, R. 1980. *Missouri River Basin, Kansas Stream Survey*. Kansas Fish and Game Commission. D-J Project F-15-R-15, Study 010, Job 020.

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

Taber, V. 1994. *Telephone Conversation*. Kansas Department of Wildlife and Parks.

3.13 GRAND RIVER

This reach begins at Pattonsburg, in Daviess County, Missouri and runs downstream through six counties (see Figure 3-13). It ends at the confluence of the Grand River with the Missouri River. It is approximately 103 river miles in length. Gallatin and Bedford, Missouri are the major communities along this reach. The Thompson River is the primary tributary that enters the Grand River along this reach.

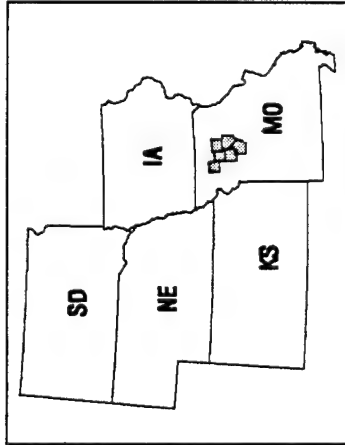
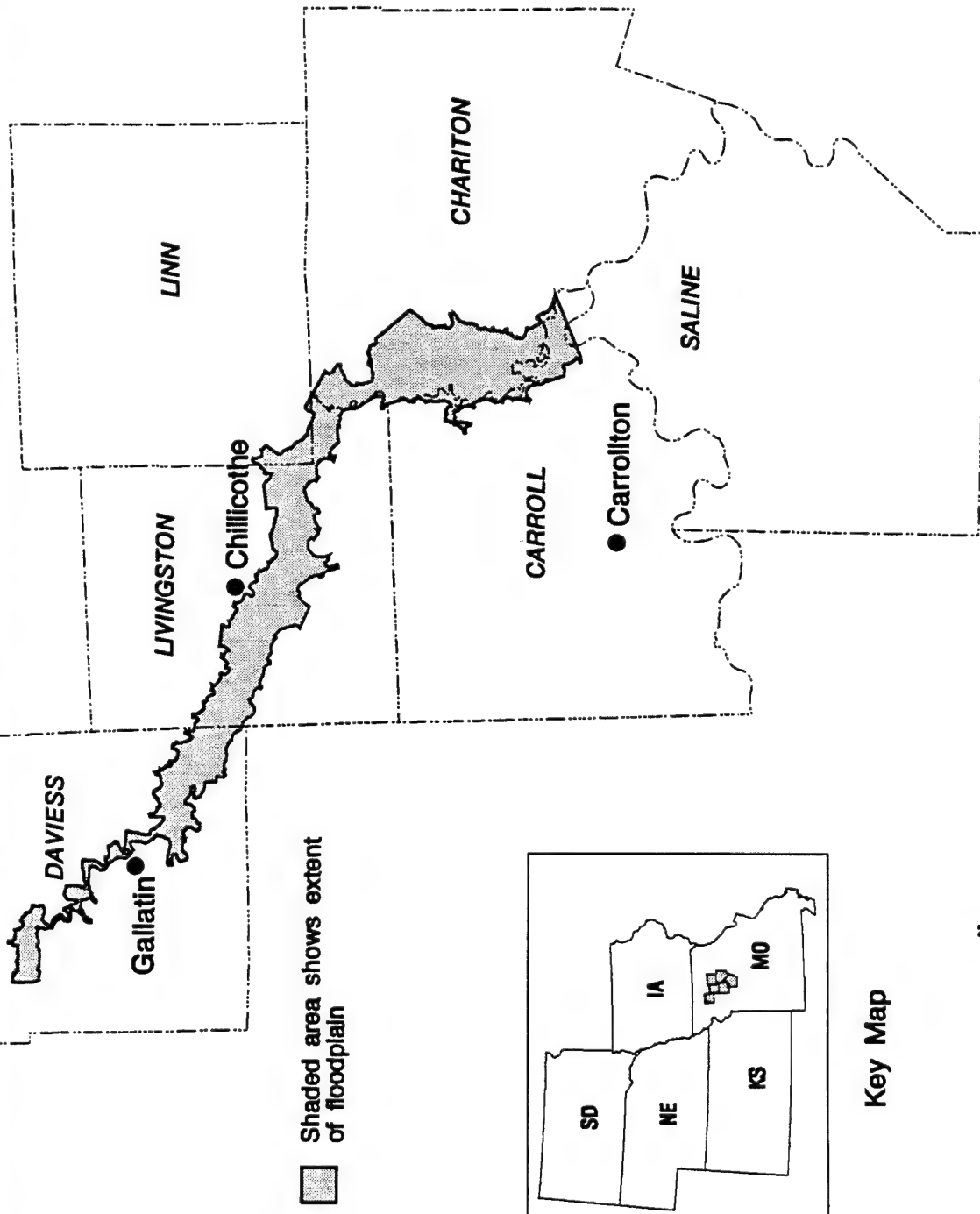
3.13.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.13-1. Descriptions of the state soil associations are provided in Appendix B.

Table 3.13-1

SOIL ASSOCIATIONS GRAND RIVER

Soil Association	State	Occurrences	Acres	Percent
COLO-NODAWAY-ZOOK	MO	2	80,460	50
LAMONI-SHELBY-ADAIR	MO	26	2,920	2
GARA-ARMSTRONG-PERSHING	MO	12	1,310	< 1
GREENTON-GOSPORT-SNEAD	MO	24	3,640	2
CARLOW-DOCKERY-FATIMA	MO	1	66,920	42
GRUNDY-LAGONDA-LAMONI	MO	14	1,670	1
HAYNIE-LETA-WALDRON	MO	2	2,840	2
NODAWAY-COLO-ZOOK	MO	1	130	< 1
KNOX-HIGGINSVILLE-SIBLEY	MO	1	400	< 1
SOIL ASSOCIATIONS SUB TOTAL	--	83	160,290	100
UNCLASSIFIED AQUATIC	MO	3	2,380	--
SOILS AND AQUATIC TOTAL	--	--	162,670	--



Key Map



Figure 3-13
Grand River

3.13.2 Land Use/Land Cover

3.13.2.1 Land Use

The total floodplain within this reach is 162,670 acres (Table 3.13-2). The river meanders through a narrow floodplain at the northern end of the reach. The floodplain is wide in eastern Daviess County. It is widest in Chariton County, and a consistent width to the confluence with the Missouri River. Agriculture, mainly cropland, is the predominant land use in this reach. Chillicothe is the largest community within this reach. Numerous small communities are also found within the reach.

Table 3.13-2

LAND USE/LAND COVER GRAND RIVER

Cover Type	Acres	Percent
Urban	790	< 1
Agriculture	126,830	78
Range	0	--
Upland Forest	200	< 1
Wetland*	23,700	14
Water	10,880	7
Barren	270	< 1
Total	162,670	100

*No NWI data available for forested wetland.

3.13.2.2 Vegetation

A narrow band of forest lines the river banks from the Missouri River to western Livingston County. At the northwest end there are only a few forested areas along the river. Oak and hickory are the dominant species on the bottomland soils (SCS, 1981).

This area once supported tall grass prairie dominated by big bluestem, Indian grass, and switchgrass. Most of the native bluestem is prevalent on noncultivated areas (SCS, 1981).

3.13.2.3 Plant Species of Special Concern

No plant species of special concern were identified within this reach.

3.13.3 Aquatic Resources

3.13.3.1 Wetlands

No NWI data was available for this study reach. Wetlands were identified by reviewing USGS topographic maps. Based on the land use/land cover data, approximately 23,700 acres of vegetated

wetlands are within the study reach. Wetland areas are present to some extent throughout the floodplain of this study reach. Few islands are within the channel of the Grand River. Most of the wetlands are directly adjacent to the main river channel or along some of the larger tributaries, lakes, or ponds. The largest concentration of wetlands is within and around the Swan Lake National Wildlife Refuge.

Vegetated wetlands are concentrated in the southern half of the reach between Chillicothe and Brunswick. Smaller areas of vegetated wetlands occur sporadically along the remainder of the reach. Small areas of both shrub/scrub and emergent wetlands line the bank from the north boundary of Chariton County to the confluence of the Missouri River. Levees in the vicinity of the confluence of the Missouri and Grand Rivers allow what was once wetland to be used as cropland.

3.13.3.2 Lakes and Ponds

Approximately 92 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 4,520 acres. The average size of each pond or lake is less than 50 acres.

Swan Lake and Silver Lake are two large lakes within the Swan Lake National Wildlife Refuge. A concentration of lakes is found in the vicinity of Fountain Grove. A second series of small lakes and ponds, including Reach Lake is south of Chillicothe.

3.13.3.3 Tributaries

Several tributaries empty into the Grand River within this particular segment. Many of these tributaries are small perennial to intermittent streams. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location
Sampson Creek	W. of Pattonsburg
Grindstone Creek	S. of Pattonsburg
Big Creek	S. of Pattonsburg
Muddy Creek	Carlow
Thompson River	W. of Chillicothe
Shoal Creek	S. of Chillicothe
Medicine Creek	E. of Chillicothe
Locust Creek	N. of Sumner
Yellow Creek	Swan Lake National Wildlife Area
Big Creek	W. of Brunswick
Salt Creek	W. of Brunswick

3.13.4 Fisheries

The lower Grand River is the largest prairie river in Missouri that is relatively unaffected by impoundments or channelization (Kramer, 1993). Forty-seven fish species have been collected from the Grand River including such uncommon species as the paddlefish, mooneye, blue sucker, blue catfish, yellow bass, trout perch, and speckled chub.

Common species known from the Grand River include channel catfish, black bullhead, yellow bullhead, carp, river carpsucker, creek chub, red shiner, sand shiner, and green sunfish (Pitchford and Kearns, 1994). Catfish are the most important sportfish in the Grand River basin. An estimated 79,920 catfish and bullheads were taken in 1975 (Fleener, 1977).

3.13.4.1 Aquatic Species of Special Concern

No protected aquatic species were identified in the database search for this reach.

3.13.4.2 Important Aquatic Habitat

Much of the unique aquatic habitat along the Grand River consists of streams that have not been channelized or that contain coarse substrate or bedrock (Pitchford and Kearns, 1994). Specifically, Marrowbone Creek in Daviess County is one of the least disturbed tributaries in the upper Grand River. Marrowbone Creek was the only northwest Missouri stream included in the proposed Natural Streams Act. Grindstone Creek, also in Daviess County, is relatively unaltered and contains gravel substrate. Grindstone Creek contains trout perch and a high quality catfish fishery. The majority of the corridor is tree-lined (Pemberton, 1982). The stream also supports a relatively diverse mussel population (Pitchford and Kearns, 1994).

3.13.5 Wildlife

The Grand River provides riparian habitat important to many wildlife species in this part of Missouri. Major wildlife species known from this reach of the Grand River include white-tailed deer, wild turkey, bobwhite quail, cottontail rabbit, numerous furbearing mammals including beaver, river otter, mink, muskrat, and coyote, and gray and fox squirrels. Bald eagles are known from throughout this reach of the Grand River.

The Grand River basin is perhaps best known in Missouri for its waterfowl habitat. The reach contains one Federal and three state-owned waterfowl areas, plus numerous privately-owned waterfowl areas. Common waterfowl species present in this reach include mallard, wood duck, pintail, northern shoveler, blue and green-winged teal, widgeon, and gadwall. Common species of geese include Canada, snow and white-fronted.

3.13.5.1 Wildlife Species of Special Concern

Four protected wildlife species are known to occur in this reach (Table 3.13-5). Two of these species are birds, one is a reptile, and one is a mammal. The bald eagle is the only species with Federal protection under the Endangered Species Act. The remainder of the protected species known to occur in this reach are listed as rare or endangered by Missouri. Chariton County has the highest number of protected species in this reach, as well as four bald eagle night roosts. There are also four great blue heron rookeries known to occur in this reach. The pied billed grebe is known to occur in the Fountain Grove Wildlife Area. The eastern massasauga rattlesnake and plains spotted skunk are known to occur in areas near Swan Lake National Wildlife Refuge in Chariton County.

Table 3.13-5

**PROTECTED WILDLIFE SPECIES
GRAND RIVER**

Species	Federal Status	Missouri Status	Site Occurrences by County
Bald Eagle	E	E	Chariton(2), Livingston(2)
Eastern Massasauga	--	E	Chariton
Pied-Billed Grebe	--	R	Linn
Plains Spotted Skunk	--	R	Chariton

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

3.13.5.2 Important Wildlife Habitat

Two major wildlife areas, numerous private duck clubs, and significant bottomland hardwoods provide important habitat for a variety of wildlife species. The Swan Lake Wildlife Area in Livingston County provides 10,700 acres of habitat important to bald eagles, eastern massasauga rattlesnakes, river otters, numerous waterfowl species, and white-tailed deer (Riley, 1993). The Fountain Grove Wildlife Area in Livingston and Linn Counties contains over 7,000 acres of habitat important to great blue herons, bald eagles, river otter, and numerous species of waterfowl. Two great blue heron rookeries and two bald eagle night roosts are known to be in the Fountain Grove Wildlife Area. One great blue heron rookery and one bald eagle night roost are known to be in the Swan Lake Wildlife Area. Migrating Canada geese numbering up to 100,000 have been observed using the fields and marshes of the Swan Lake Wildlife Area.

3.13.6 Fish and Wildlife Management Areas

This study reach contains four major FWMAs, found within four counties. One Federal management area, the Swan Lake National Wildlife Refuge, is within this study reach. The remaining three are state areas. The four FWMAs are listed in Table 3.13-6; the acreage of each is also listed.

Table 3.13-6

**FISH AND WILDLIFE MANAGEMENT AREAS
GRAND RIVER**

Management Areas	State	County	Type	Acres
Yellow Creek Conservation Area	MO	Chariton	S	618
Swan Lake National Wildlife Refuge	MO	Chariton	F	10,700
Fountain Grove Wildlife Area	MO	Linn, Livingston	S	7,154
Gallatin Wildlife Area	MO	Daviess	S	669
Total Identified Acreage	--	--	--	19,141

Type: Federal (F), State (S), Local (L) ND = No Data

The 10,700-acre Swan Lake National Wildlife Refuge, the largest and only Federal management area within this study reach, is near Mendon in Chariton County. Although named Swan Lake National Wildlife Refuge, the swans that once inhabited this refuge are rarely seen anymore, being replaced by the Canada geese that migrate to the Swan Lake area in great numbers, sometimes exceeding 100,000. Bird species often seen at the refuge include: bobwhites; horned larks; flickers; red-headed and red-bellied woodpeckers; and barred, screech, and great horned owls. Other species seen frequently are coots, swallows, great blue and green-backed herons, great egrets, and thrushes. Migrations of five different species of hawks have been witnessed throughout the spring and fall. Wildlife inhabiting the Swan Lake National Wildlife Refuge include deer, red foxes, and coyotes. Hunting, fishing, boating, and photography are opportunities available at this refuge (Riley, 1993).

The Fountain Grove Wildlife Area, in both Linn and Livingston counties, Missouri, consists of ten lakes, the largest of which is 252 acres. Hunting, boating, camping, and fishing are common activities at this site.

Gallatin Wildlife Area, south of Gallatin provides boating, fishing, camping, and hunting facilities. The area includes four small ponds and a shooting range.

Yellow Creek Conservation Area, west of Mendon near Swan Lake National Wildlife Refuge, contains five lakes, the largest of which is 70 acres. It permits turkey, small game, deer, and waterfowl hunting. Fishing and camping facilities are also available.

3.13.7 Natural Areas

Two natural areas are listed in the Grand River floodplain, totalling 1,400 acres. The areas are listed by county, ownership, and acreage in Table 3.13-7.

Table 3.13-7

**NATURAL AREAS
GRAND RIVER**

Natural Areas	State	County	Type	Acres
Yellow Creek Research Natural Area	MO	Chariton	F	1,000
Sumner Swamp Natural Area	MO	Chariton	P	401
Total Identified Acreage	--	--	--	1,401

Type: Federal (F), State (S), Private (P) ND = No Data

Yellow Creek Research Natural Area is at the confluence of Yellow Creek and the Grand River. This Federally-owned area features second-growth bottomland forest and shrub-swamp. The area is relatively unaltered in its hydrology, is considered a statewide significant aquatic area and is excellent raptor habitat. Summer Swamp is listed as a statewide significant natural area. The area is frequently flooded by the Grand River. Permanent open water areas are host to a state-endangered raptor, as well as other migratory birds (Anderson, 1982).

3.13.8 Recreation Areas

No recreation areas were identified in this study reach.

3.13.9 Data Gaps

No NWI wetlands data were available for this reach. Wetland descriptions were developed from review of USGS maps. Total wetland acreage was taken from the land use/land cover data.

3.13.10 References Cited

- Anderson, J.E. 1982. *Missouri Natural Areas Inventory: Adair, Chariton, Linn, Macon, Putnam, Randolph, Sullivan, and Schuyler Counties*. Missouri Department of Conservation, Jefferson City, MO.
- Fleener, G.C. and Gogel, M.B. 1977. *Minnesota River Facilities Guide - Minneapolis, Minnesota to the Mouth of the Ohio River*. Upper Mississippi River Conservation Committee.
- Kramer, K. 1993. *Missouri Natural Features Inventory: Andrew, Atchison, Gentry, Holt, Nodaway and Worth Counties*. Missouri Department of Conservation. Jefferson City, MO.
- Pemberton, M.A. 1982. *Canoeing in Northern Missouri, an Introduction to Floatable Streams North of the Missouri River*. Missouri Department of Natural Resources. Jefferson City, Missouri.
- Pitchford, G. and Kearns, H. 1994. *Grand River Inventory and Management Plan*. Missouri Department of Conservation. Chillicothe, MO.
- Riley, L. and Riley, W. 1993. *Guide to the National Wildlife Refuges*. MacMillan Publishing Company. New York, NY.

Floodplain Management Assessment

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

3.14 MISSOURI RIVER: GLASGOW TO ST. CHARLES, MISSOURI

This study reach begins at Glasgow, Missouri (RM 226) and ends at St. Charles, Missouri (RM 29) (see Figure 3-14). It is approximately 197 river miles in length. The reach runs through 14 counties in Missouri. Jefferson City and St. Charles, Missouri are the major communities along this reach. Cedar Creek is a primary tributary that enters the Missouri River along this reach.

3.14.1 Soils

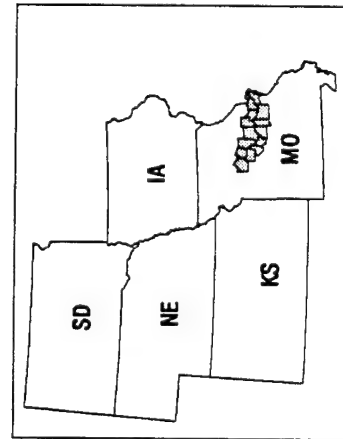
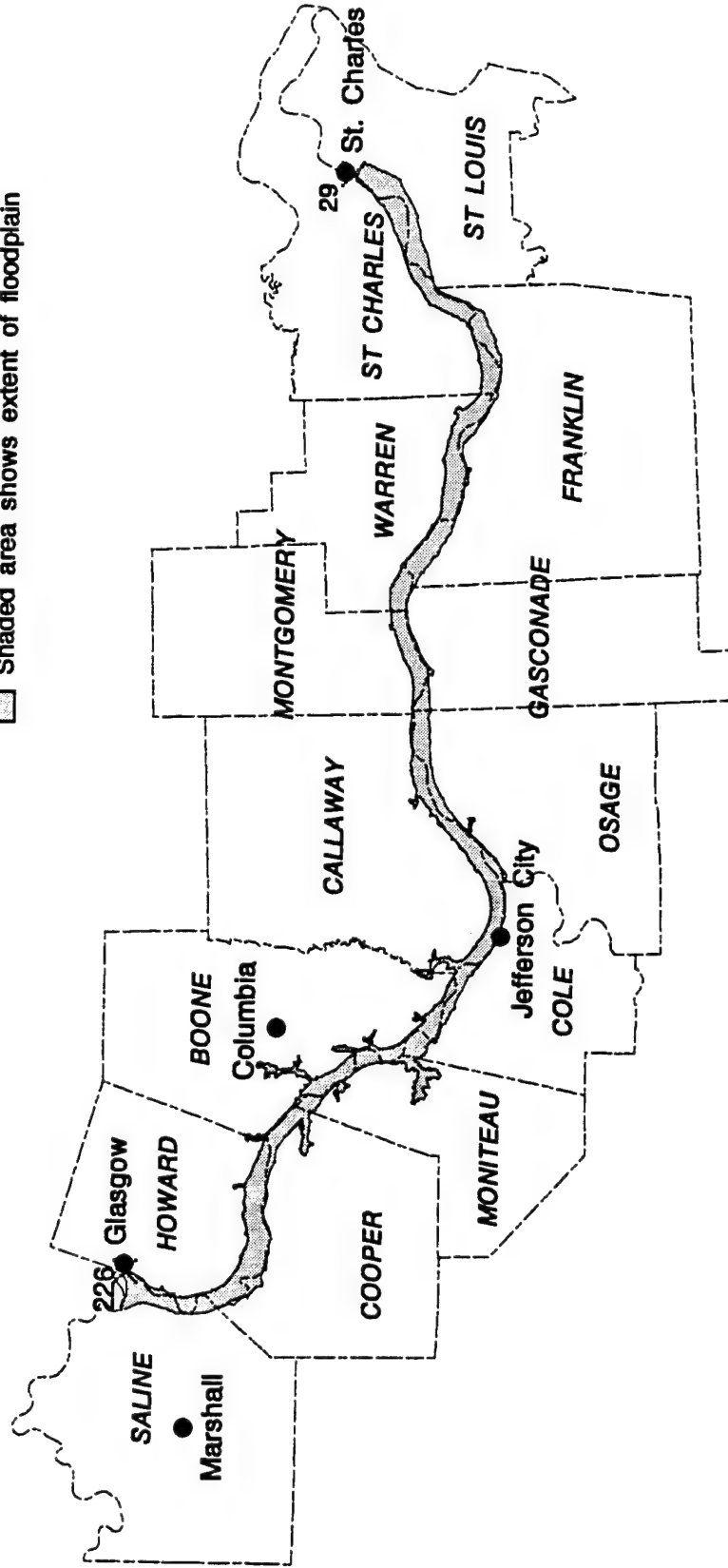
The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.14-1. Descriptions of the state soil associations are provided in Appendix B.

Table 3.14-1

SOIL ASSOCIATIONS MISSOURI RIVER: GLASGOW - ST. CHARLES

Soil Association	State	Occurrences	Acres	Percent
HAYNIE-LETA-WALDRON	MO	1	7,110	3
KNOX-HIGGINSVILLE-SIBLEY	MO	8	2,370	1
HAYNIE-WALDRON-BLAKE	MO	25	182,810	79
MENFRO-WINFIELD-WELLER	MO	72	12,490	5
CARLOW-DOCKERY-FATIMA	MO	4	3,430	1
PERSHING-GREENTON-DOCKERY	MO	2	50	< 1
MENFRO-WINFIELD-HAYMOND	MO	55	15,190	7
DOCKERY-ZOOK-BLACKOAR	MO	3	1,680	< 1
URBAN.LAND-HARVESTER-FISHPOT	MO	3	540	< 1
BARDLEY-GASCONADE-CEDARGAP	MO	6	1,230	< 1
BUCKLICK-CANEYVILLE-GATEWOOD	MO	2	360	< 1
GOSS-PEMBROKE-UNION	MO	2	2,950	1
HAYMOND-DOCKERY-MONITEAU	MO	1	40	< 1
HAYMOND-WILBUR-FREEBURG	MO	5	670	< 1
SOIL ASSOCIATIONS SUB TOTAL	--	189	230,920	100
UNCLASSIFIED AQUATIC	ALL	5	35,820	--
SOILS AND AQUATIC TOTAL	--	--	266,740	--

Shaded area shows extent of floodplain



Key Map



Figure 3-14

Missouri River:
Glasgow to St. Charles, Missouri

3.14.2 Land Use/Land Cover

3.14.2.1 Land Use

The total area of floodplain within this reach covers 266,740 acres (Table 3.14-2). The floodplain is a consistent width of approximately two miles. It is narrower than the reaches further north and west and traverses steeper terrain. The river meanders from one side of the floodplain to the other.

Table 3.14-2

**LAND USE/LAND COVER
MISSOURI RIVER: GLASGOW - ST. CHARLES**

Cover Type	Acres	Percent
Urban	6,300	2
Agriculture	189,640	71
Upland Forest	800	< 1
Forested Wetland	23,350	9
Non-Forested Wetland	11,950	4
Water	33,850	12
Barren	850	< 1
Total	266,740	100

Urban areas within the reach include Jefferson City and St. Charles, Missouri. Railroad tracks are along both sides of the river the entire length of the reach.

3.14.2.2 Vegetation

On the left descending bank of the river, the majority of the reach is within the oak-hickory savanna ecological region. Levees have been built all along the river to protect agricultural land. The southern portion of the reach lies within the transitional zone between the oak-hickory forest and the bluestem prairies. Grasslands supporting big bluestem, little bluestem, Indian grass, and switchgrass are interspersed with forested areas. Much of the grassland has been converted to agricultural crop production.

3.14.2.3 Plant Species of Special Concern

No plant species of special concern were identified in the database search for this reach.

3.14.3 Aquatic Resources

3.14.3.1 Wetlands

Within this study reach, approximately 34,940 acres of vegetated wetland are in the adjacent floodplain. The majority are classified as forested wetland (Table 3.14-3).

Table 3.14-3

AQUATIC RESOURCES
MISSOURI RIVER: GLASGOW - ST. CHARLES

Wetland Class	Acres	Percent
Forested	23,350	67
Shrub/Scrub	1,350	4
Emergent	10,240	29
Water Resources	Acres	Number
Lakes & Ponds	1,170	55

Vegetated wetlands appear to be evenly distributed along the river segment. Wetland habitats are associated with several islands that have formed within the channel of the Missouri River. In general, wetlands are around the perimeter of these islands and the remaining land is used for agriculture. Some of the major islands containing wetland areas include:

Island	River Mile
Jameson Island	213
Wallace Island	206
Franklin Island	194
Tadpole Island	179
St. Aubert Island	122
Binggeli Island	117
Heckman Island	107
Goose Island	79
Miller Island	70
Howell Island	47
Johnson Island	42
Bonhomme Island	40
Catfish Island	36

South of Columbia, Missouri an area of forested wetlands is along the right descending bank of the river between RM 176 and RM 172. Wetlands are also along several small drainage channels in this area.

Wetland areas on Franklin Island are included in the Franklin Island Wildlife Area. This area is on the left descending bank of the river directly east of Booneville, Missouri. Forested wetlands are also on the right descending bank of the river in this location.

St. Aubert Island is east of Jefferson City in Osage County. This island is along the right descending bank of the river between RM 125 and RM 120. Several areas of forested wetland are on this island and along the Missouri River west of St. Aubert Island.

Several wetland areas are east of Hermann, Missouri. These areas are mainly forested wetlands that are associated with several small ponds and side channels of the Missouri River. These wetlands are along the left descending bank of the river between RM 94 and RM 97 and along the right descending bank of the river between RM 95 and RM 83.

Wetland areas are associated with numerous small oxbow lakes and side channels east of Washington, Missouri. In the Hancock Bottom area in St. Charles County, a series of oxbow lakes have associated forested wetlands. Similar areas are found between RM 58 and RM 51 in the Labadie Bottoms on the right descending bank of the Missouri River. Several forested areas are also in the Darst Bottoms adjacent to RM 54 through RM 51.

Along the left descending bank of the Missouri River, several areas of forested and emergent wetlands are included in the Weldon Spring Wildlife Area. Several areas of forested wetlands are also on Howell Island which is within the Howell Island Wildlife Area. Directly south of Howell Island, several wetland areas are associated with a smaller island that is not in the wildlife management area.

Areas of forested and emergent wetlands are found in the area of Johnson, Bonhomme, and Catfish Islands southwest of St. Charles, Missouri. This includes the Green Bottom area in St. Charles County which also has several areas of forested wetlands. Wetlands are also present east of Catfish Island, along the left descending bank of the Missouri River.

3.14.3.2 Lakes and Ponds

Approximately 55 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 1,170 acres. Many of the water bodies have small surface areas. The average size of each pond or lake is approximately 21 acres. Nearly all of these water bodies are small ponds or oxbow lakes. Wetlands surround most of these lakes.

The largest lake in this study area is Creve Coeur Lake south of St. Charles, Missouri. Several areas of forested and emergent wetlands occur near this lake, especially to the south along the Creve Coeur River.

3.14.3.3 Tributaries

Several tributaries empty into the Missouri River within this particular segment. Many of these tributaries are small perennial to intermittent streams. However, several larger water ways have their confluence within the river reach. Following is a list of the major tributaries and their locations:

Tributary	Confluence Location	River Mile
Lamine River	W. of Boonville, MO	202
Moreau River	E. of Jefferson City, MO	138
Osage River	E. of Jefferson City, MO	130
Middle River	E. of Jefferson City, MO	123
Gasconade River	Gasconade, MO	104
Loutre River	Hermann, MO	97

Areas of forested wetlands are near the confluence of the Osage and Missouri Rivers. These wetlands are mainly along the left descending bank of the Missouri River between RM 132 and RM 128.

Additional wetland areas occur along the Loutre River and also along the Missouri River at the confluence of these two rivers.

3.14.4 Fisheries

The Missouri River between Glasgow and St. Charles provides habitat for numerous fish species. Ninety-one fish species have been reported from the mainstem Missouri River (Galat et al., 1994). Major species which inhabit this reach include channel and flathead catfish, crappie, and white bass. Minor species include largemouth bass, paddlefish, walleye, and sauger. Important commercial species include carp, buffalo, and freshwater drum (Robinson, 1994).

3.14.4.1 Aquatic Species of Special Concern

Eight protected fish species are known to occur in this reach (Table 3.14-4). The pallid sturgeon is the only fish species occurring in this reach with Federal protection under the Endangered Species Act. The remainder of the protected species are listed as rare or endangered by the state of Missouri. Six protected species including the pallid and lake sturgeons, have been observed in Boone County.

Table 3.14-4

**PROTECTED AQUATIC SPECIES OF THE MISSOURI RIVER
GLASGOW - ST. CHARLES**

Species	Federal Status	Missouri Status	Site Occurrences by County
Alabama Shad	--	R	Boone(2), Warren
Brassy Minnow	--	R	Moniteau
Flathead Chub	--	E	Boone(2)
Lake Sturgeon	--	E	Boone
Northern Pike	--	R	Calloway
Pallid Sturgeon	E	E	Boone
Sicklefin Chub	--	R	Boone(3), Calloway, Warren, Moniteau, St. Charles
Sturgeon Chub	--	R	Boone(2), Calloway, Cooper, Gasconade, Warren

E = listed as endangered T = listed as threatened R = rare (comparable to threatened)

3.14.4.2 Important Aquatic Habitat

Sand islands, side channels, and the mouths of the tributaries provide important habitat for a variety of aquatic species. Areas of the lower Missouri River near Hermann, Missouri have been identified as some of the best remaining aquatic habitat on the Missouri River (Grace, 1994). Discharges from the Osage and Gasconade Rivers and other tributaries in this area simulate pre-settlement drainage patterns and provide important habitat for the lake and pallid sturgeons. The area near Hermann, Missouri has been identified as a release site for both the lake and pallid sturgeons. Deepwater areas near the mouths of tributaries provide important habitat for channel and flathead catfish. Specifically, the mouths of Perche Creek in Boone County and Petite-Saline Creek in Cooper County provide important habitat for channel catfish (Grace, 1994). Sand Islands, where available, provide important nursery areas for catfish and other species. Rock revetments and dike pools also provide important habitat for various aquatic species.

3.14.5 Wildlife

The Missouri River corridor between Glasgow and St. Charles, Missouri provides habitat for numerous species of wildlife. White-tailed deer, turkey, bobwhite quail, cottontail rabbit, and various species of furbearers are all common throughout this reach. The Missouri River provides an important corridor for migrating waterfowl. Major waterfowl species occurring along this reach include mallard, wood duck, northern shoveler, green-winged and blue-winged teal, and snow and Canada geese. Bald eagles are also commonly seen throughout this reach.

3.14.5.1 Wildlife Species of Special Concern

The bald eagle and American bittern are the only two protected wildlife species occurring in this reach (Table 3.14-5). The bald eagle is listed as endangered under the Endangered Species Act. The American bittern is listed as endangered by the state of Missouri and has been observed near Creve Coeur in St. Louis County. Two bald eagles night roosts are in this reach. One is in St. Louis County near Chesterfield and the other is in Osage County. A bald eagle nest is in Callaway County near Jefferson City.

Table 3.14-5

PROTECTED WILDLIFE SPECIES OF THE MISSOURI RIVER GLASGOW - ST. CHARLES

Species	Federal Status	Missouri Status	Site Occurrences by County
American Bittern	--	E	St. Charles
Bald Eagle	E	E	Calloway, Osage, St. Charles

E = listed as endangered T = listed as threatened

3.14.5.2 Important Wildlife Habitat

Numerous islands scattered throughout this reach provide important habitat for bald eagles and other wildlife species. The Weldon Spring Wildlife Area in St. Charles County provides important habitat for wild turkeys, white-tailed deer, and other species. Both Eagle Bluffs Wildlife Area in Boone County and Howell Island Wildlife Area in St. Charles County provide important habitat for migrating bald eagles and waterfowl. The mouths of the Gasconade and Osage Rivers provide important fishing areas for bald eagles in winter. Numerous wetlands near Bon Homme and Johnson Islands in St. Charles and St. Louis County provide important habitat for the American bittern.

3.14.6 Fish and Wildlife Management Areas

This study reach contains nine major FWMAs, located in seven counties in Missouri. Two are Federally-owned; seven are state-owned. The seven state-owned FWMA comprise approximately 16,435 acres of land and water, and range in size from 123 acres to 7,355 acres. The FWMAs and the acreage of each are listed in Table 3.14-6.

Table 3.14-6

**FISH AND WILDLIFE MANAGEMENT AREAS
MISSOURI RIVER: GLASGOW - ST. CHARLES**

Management Areas	State	County	Type	Acres
Louis H. Bangert Memorial Wildlife Area	MO	St. Charles	S	160
Howell Island Conservation Area	MO	St. Charles, St. Louis	S	2,541
Overton Bottoms	MO	Saline	F	1,400
Morrison Bend	MO	Calloway	F	400
Weldon Spring Conservation Area	MO	St. Charles	S	7,355
Grand Bluffs Conservation Area	MO	Montgomery	S	223
Eagle Bluffs Conservation Area	MO	Boone	S	3,635
Davisdale Wildlife Area	MO	Howard	S	2,398
Riverwoods Conservation Area	MO	St. Louis	S	123
Total Identified Acreage	--	--	--	18,235

Type: Federal (F), State (S), Local (L)

ND = No Data

Weldon Spring Conservation Area, south of O'Fallon in St. Charles County, is the largest management area within this study reach. The wildlife area consists of four lakes, the largest of which is 35 acres, and provides opportunities for fishing, hunting, and hiking. The Eagle Bluffs Conservation Area, southwest of Columbia Boone County, provides hunting, fishing, and boating opportunities.

The Davisdale Wildlife Area in Howard County is a wildlife area offering hunting, fishing, boating, camping, and hiking facilities. East of Booneville, the Davisdale area contains seven lakes, the largest of which is 10 acres. Wildlife inhabiting the area include waterfowl, deer, and turkey.

The Howell Island Conservation Area, south of St. Charles, provides hunting, fishing and hiking opportunities, as well as boating facilities. Grand Bluffs Conservation Area, east of Hermann in Montgomery County, offers deer, turkey, waterfowl, and small game hunting. Situated east of St. Charles, Louis H. Bangert Memorial Wildlife Area has fishing and camping available. Riverwoods Conservation Area is west of Bridgeton in St. Louis County. Fishing and boating activities are available at the site.

The USCOE has acquired two wildlife habitat mitigation sites within this reach since the flood of 1993. Overton Bottoms in Saline County contains approximately 1,400 acres, while Morrison Bend contains approximately 400 acres in Calloway County.

3.14.7 Natural Areas

Five natural areas that include more than 600 acres were identified in this study reach. Features include old growth forest as well as dolomite and limestone cliffs. The areas are listed by county, ownership, and acreage in Table 3.14-7.

Table 3.14-7

NATURAL AREAS MISSOURI RIVER: GLASGOW - ST. CHARLES

Natural Areas	State	County	Type	Acres
Schnabel Woods Natural Area	MO	Boone	P	80
Engelmann Woods Natural Area	MO	Franklin	S	145
Weldon Spring Hollow Natural Area	MO	St. Charles	S	385
Babler Southwoods Hollow Natural Area	MO	St. Louis	S	17
Wegener Woods Natural Study Area	MO	Warren	--	--
Total Identified Acreage	--	--	--	627

Type: Federal (F), State (S), Private (P) ND = No Data

The Schnabel Woods Natural Area, southwest of McBaine, features river hills vegetated with rich old-growth forest. Two intermittent streams traverse the area to converge with Perche Creek. The area is owned by the University of Missouri. In Engelmann Woods, northeast of Labadie, river hills, small creeks, and dolomite cliffs are vegetated by old growth forest. The area has many fern species and is noted for spring and fall wildflower displays. Weldon Spring Hollow Natural Area is within the Weldon Spring Conservation Area. The area features limestone cliffs and intermittent streams. This rugged riverbreak topography is used for nesting by Canada geese. Babler Southwoods Hollow Natural Area is in Edmund Babler State Park near Ballwin. The terrain is limestone capped with loess, vegetated in old-growth white oak-sugar maple mesic upland forest. Wegener Woods in southern Warren County has old growth white oak-maple forest. Some trees are 200 years old. Maple windfall in the area makes for an excellent study of successional trends in forest community (Bolger and Nigh, 1986; Thom and Iffrig, 1985).

3.14.8 Recreation Areas

This study reach contains four major recreation areas, three of which are state-owned. No Federal recreational areas are within this study reach. Hiking/biking activities are the most prevalent available recreational opportunities available within this study reach. The four recreation areas and the activities which they provide are listed in Table 3.14-8.

Arrow Rock State Park, an historic site in Saline County, Missouri, offers camping, picnicking, and hiking facilities. Painted Rock State Forest, west of Westphalia in Osage County, Missouri, includes a four-acre lake. Fishing, boating, hiking, camping, and hunting are common activities within the state forest. Creve Coeur Lake in St. Louis provides fishing and boating opportunities.

Table 3.14-8

RECREATION AREAS
MISSOURI RIVER: GLASGOW - ST. CHARLES

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Katy Trail State Park	MO	**	--	S	--	--	--	X	--
Creve Coeur Lake	MO	St. Louis	320	L	--	--	X	--	X*
Painted Rock State Forest	MO	Osage	1,490	S	X	--	X	X	X*
Arrow Rock State Park	MO	Saline	139	S	X	X	--	X	--
Total Identified Acreage	--	--	1,949	--	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

** St. Charles, Warren, Montgomery, Callaway, Boone, Howard, Saline

3.14.9 Data Gaps

There were no data gaps for this reach.

3.14.10 References Cited

Bolger, D. and T.H. Nigh. 1986. *Missouri Natural Features Inventory: Lincoln, Pike, St. Charles and Warren Counties*. Missouri Department of Conservation. Jefferson City, MO.

Galat, D.L., J.W. Robinson, and L.W. Hesse. 1994. *Restoring Aquatic Resources to the Lower Missouri River: Issues and Initiatives*. Missouri Cooperative Fish and Wildlife Research Unit. Columbia, MO.

Grace, T.B. 1994. *Telephone Conversation*. Missouri Department of Conservation.

Robinson, J.W. 1994. *Missouri Commercial Fishery Harvest, 1992*. Missouri Department of Conservation. Columbia, MO.

Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Natural Resources. Jefferson City, MO.

3.15 MISSOURI RIVER: ST. CHARLES TO THE MISSISSIPPI RIVER

This study reach begins at St. Charles, Missouri (RM 29) and ends where the Missouri River enters the Mississippi River floodplain (RM 16, see Figure 3-15). It is approximately 13 river miles in length. St. Louis is the major community along this reach. The reach runs through two counties in Missouri.

3.15.1 Soils

The soil associations that occur within this reach, as well as the acreage within each association are listed in Table 3.15-1. Descriptions of the state soil associations are provided in Appendix B.

Table 3.15-1

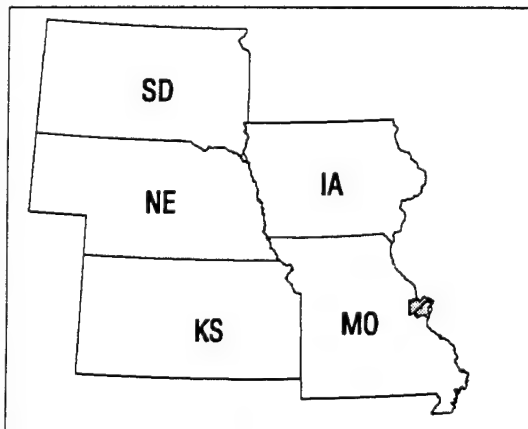
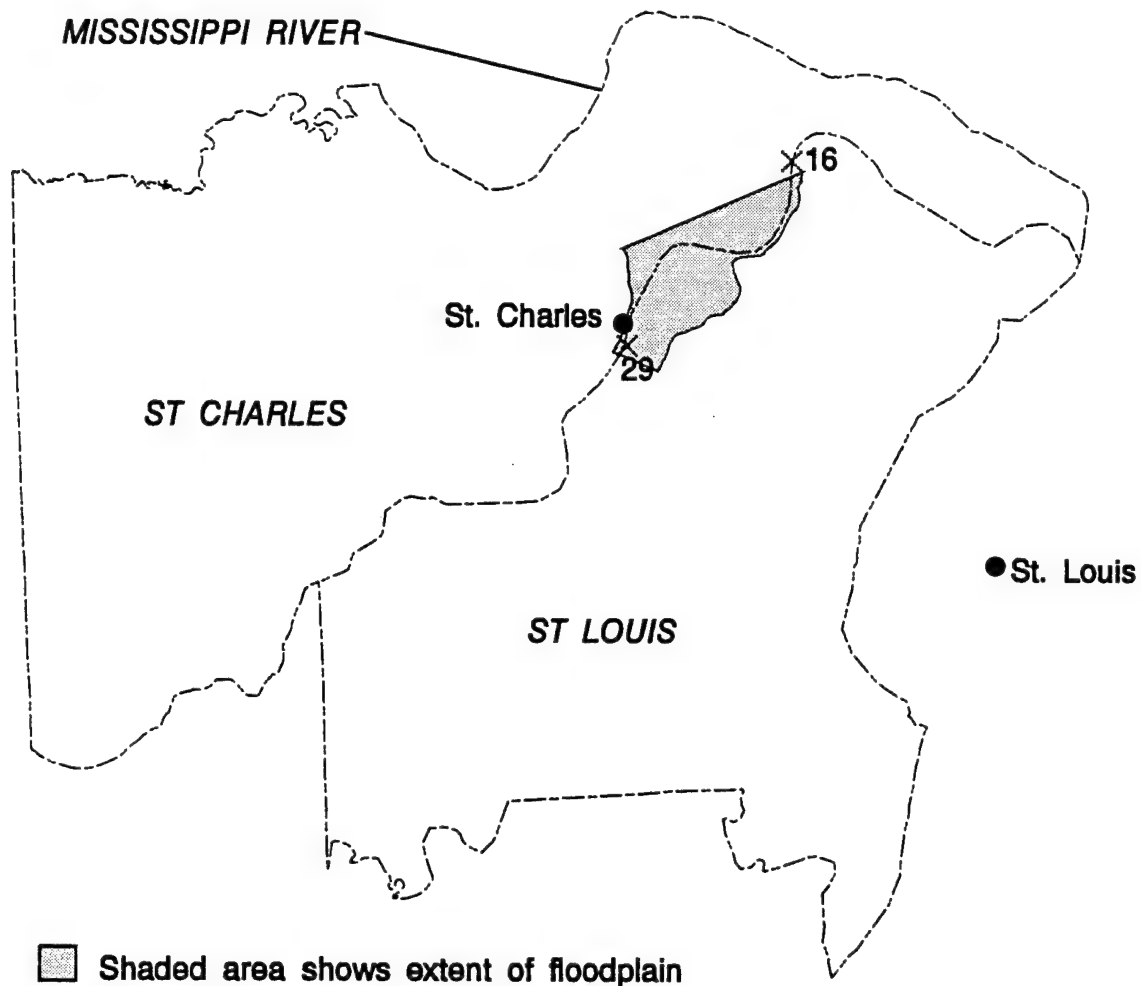
SOIL ASSOCIATIONS MISSOURI RIVER: ST CHARLES - MISSISSIPPI RIVER

Soil Association	State	Occurrences	Acres	Percent
MENFRO-WINFIELD-HAYMOND	MO	3	630	4
HAYNIE-WALDRON-BLAKE	MO	3	14,620	94
LOMAX-BLASE-BOOKER	MO	1	260	1
MENFRO-WINFIELD-WELLER	MO	1	70	< 1
SOIL ASSOCIATIONS SUB TOTAL	--	8	15,580	100
UNCLASSIFIED AQUATIC	ALL	1	2,890	--
SOILS AND AQUATIC TOTAL	--	--	18,470	--

3.15.2 Land Use/Land Cover

3.15.2.1 Land Use

The total area of floodplain within this reach covers approximately 18,470 acres (Table 3.15-2). Urban areas within the reach include St. Charles and Bridgeton. A railroad line follows the left descending bank of the river.



Key Map



Figure 3-15
Missouri River:
St. Charles to the Mississippi River

Table 3.15-2

LAND USE/LAND COVER
MISSOURI RIVER: ST. CHARLES - MISSISSIPPI RIVER

Cover Type	Acres	Percent
Urban	2,660	14
Agriculture	10,530	57
Range	0	--
Upland Forest	10	< 1
Forested Wetland	2,280	12
Non-Forested Wetland	690	4
Water	2,050	11
Barren	250	1
Total	18,470	100

Over half the reach is used for agriculture. Levees along much of this stretch of river protect the agricultural lands from flooding. Food grains, vineyards, and orchards are the major crop uses. The remainder of the agricultural land is pasture or grassland (SCS, 1981).

3.15.2.2 Vegetation

The reach lies within the oak-hickory savanna ecological region. The area has been almost entirely cleared for urban development or agriculture. Small forested areas are along the right descending bank north of St. Charles and between the levees and the river. Oak and hickory are the major tree species (SCS, 1981).

3.15.2.3 Plant Species of Special Concern

No plant species of special concern were identified within this reach.

3.15.3 Aquatic Resources

3.15.3.1 Wetlands

Approximately 3,120 acres of vegetated wetland are in the adjacent floodplain. The majority are classified as forested wetland (Table 3.15-3). The vegetated wetlands appear to be evenly distributed along the river segment. Forested wetland habitats are on Bryan Island within the channel of the Missouri River. Narrow bands of wetlands are also adjacent to the main river channel. Levees have been built adjacent to the river on both sides. Small scattered areas of wetlands are found between the river and the levees. Most of these wetlands are classified as shrub/scrub.

Table 3.15-3

AQUATIC RESOURCES
MISSOURI RIVER: ST. CHARLES - MISSISSIPPI RIVER

Wetland Class	Acres	Percent
Forested	2,280	78
Shrub/Scrub	130	5
Emergent	500	17
Water Resources	Acres	Number
Lakes & Ponds	210	16

A large area of wetlands called Marais Creek is northeast of St. Charles. This area contains both emergent and shrub/scrub wetland vegetation. The Louis Bangert Wildlife Area is adjacent to the river southeast of St. Charles. Both scrub/shrub and forested wetlands are within this 160-acre wildlife area.

3.15.3.2 Lakes and Ponds

Approximately 16 individual lakes and ponds are within the river segment. The total surface area of these lakes and ponds is approximately 210 acres. Many of the water bodies have small surface areas, the average size being approximately 13 acres. Several long narrow ponds or lakes make up the Car of Commerce Chute north of Florissant.

3.15.3.3 Tributaries

Only one tributary empties into the Missouri River within this particular segment, the Creve Coeur Creek, just east of St. Charles.

3.15.4 Fisheries

The Missouri River between St. Charles and its confluence with the Mississippi River provides habitat for numerous aquatic species. Major fish species known from this reach include channel and flathead catfish, crappie, and white bass. Minor fish species known from this reach include largemouth bass, paddlefish, and walleye. Species important to the commercial fishing include carp, buffalo, and freshwater drum.

3.15.4.1 Aquatic Species of Special Concern

The pallid sturgeon occurs in this reach. It is considered endangered by the Federal government and the state of Missouri (Table 3.15-4).

Table 3.15-4

**PROTECTED AQUATIC SPECIES OF THE MISSOURI RIVER
ST. CHARLES - MISSISSIPPI RIVER**

Species	Federal Status	Missouri Status	Site Occurrences by County
Pallid Sturgeon	E	E	All

E = listed as endangered

T = listed as threatened

3.15.4.2 Important Aquatic Habitat

No areas of important aquatic habitat within this reach were identified by state or Federal agencies.

3.15.5 Wildlife

Numerous islands, wetlands, and bottomland hardwood forest throughout this reach provide important habitat for various species of wildlife. Major wildlife species known to occur in this reach include white-tailed deer, wild turkey, quail, cottontail rabbit, fox and gray squirrel, and numerous furbearing mammals. Major waterfowl species include mallard, wood duck, northern shoveler, blue-winged teal, and the Canada goose. Bald eagles are known to occur throughout this reach.

3.15.5.1 Wildlife Species of Special Concern

The bald eagle is the only protected wildlife species identified in this reach. It is considered endangered at the Federal level and at the state level (Table 3.15-5).

Table 3.15-5

**PROTECTED WILDLIFE SPECIES OF THE MISSOURI RIVER
ST. CHARLES - MISSISSIPPI RIVER**

Species	Federal Status	Missouri Status	Site Occurrences by County
Bald Eagle	E	E	All

E = listed as endangered

3.15.5.2 Important Wildlife Habitat

Bryan Island in St. Louis County provides important habitat for bald eagles, wild turkey, and white-tailed deer. No other areas in this reach have been defined as important habitat by state or Federal natural resource agencies.

3.15.6 Fish and Wildlife Management Areas

This study reach contains three major FWMAs, within St. Charles and St. Louis counties in Missouri. None of the management areas are Federal. The three management areas and the acreage of each are listed in Table 3.15-6.

Table 3.15-6

FISH AND WILDLIFE MANAGEMENT AREAS MISSOURI RIVER: ST. CHARLES - MISSISSIPPI RIVER

Management Areas	State	County	Type	Acres
Louis H. Bengert Memorial Wildlife Area	MO	St. Charles	ND	160
Riverwoods Conservation Area	MO	St. Louis	ND	123
Hickory Woods Conservation Area	MO	St. Louis	ND	11
Total Identified Acreage	--	--	--	294

Type: Federal (F), State (S), Local (L) ND = No Data

The Louis H. Bangert Memorial Wildlife Area is the largest FWMA found within this study reach. east of St. Charles, the area offers fishing and camping facilities. Riverwoods Conservation Area and Hickory Woods Conservation Area are both located within St. Louis County. The Riverwoods area is west of Bridgeton and provides boating and fishing opportunities. The Hickory Woods area is a small conservation area in Bridgeton; it provides a hiking trail.

3.15.7 Natural Areas

Pelican Island, north of Florissant in St. Louis County, Missouri, is the only listed natural area within this study reach. The area is a 2,103-acre portion of the Pelican Island County Park. White pelicans use this river island which features bottomland forest, chutes, sloughs, shifting, sandbars, and mudflats. It is managed by the St. Louis County Department of Parks and Recreation (Thom and Iffrig, 1985).

Table 3.15-7

NATURAL AREAS MISSOURI RIVER: ST. CHARLES - MISSISSIPPI RIVER

Natural Areas	State	County	Type	Acres
Pelican Island	MO	St. Louis	P	2,103

Type: Federal (F), State (S), Private (P) ND = No Data

3.15.8 Recreation Areas

The undeveloped Pelican Island County Park, north of Florissant in St. Louis County, is managed by the St. Louis County Parks and Recreation Department. The park is the only recreation area within this study reach.

Table 3.15-8

RECREATION AREAS MISSOURI RIVER: ST. CHARLES - MISSISSIPPI RIVER

Recreation Area	State	County	Acres	Type	Camping	Picnicking	Hunting/ Fishing	Hiking/ Biking	Water Activities
Pelican Island County Park	MO	St. Louis	ND	L	--	--	--	--	--

Type: Federal (F), State (S), Local (L)

ND = No Data

*Boat Access

3.15.9 Data Gaps

There were no data gaps for this reach.

3.15.10 References Cited

Byrd, B. and Byrd, R. 1993. *Missouri Outdoor Atlas*. Warsaw, MO.

Soil Conservation Service. 1981. *Land Resources and Major Land Resource Areas of the United States*. Washington, D.C.

Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.

4.0 EFFECTS OF FLOODING

4.0 EFFECTS OF FLOODING

Riverine systems are dynamic ecosystems with great variations in size and species diversity, from small intermittent or temporary streams to large systems such as the Mississippi River. Annual patterns of stream flow determine many of the physical and biological properties of lotic (flowing water) systems. The vegetation and wildlife in a river ecosystem have adapted to and depend on the periodic rise and fall of the river. Flooding in a lotic system can have both beneficial and detrimental impacts to the biota of the system. In a riparian environment, the various plants and animals have adapted to the riverine habitat and can usually rebound quickly from the effects of flooding. Although some initial displacement of wildlife and vegetation may occur, flooding would generally have a positive impact on native floodplain species (Allen, 1993). In an aquatic environment, species are adapted to this type of environment and although initial disruption to habitat may occur, most species of invertebrates and fish are able to find suitable habitat in other areas of the riverine system.

Impacts due to flooding can be separated into beneficial and detrimental effects, although these are not always distinct. In a single community, an event such as flooding may be beneficial to some species while detrimental to others. Because of this, the delineation between beneficial and detrimental impacts may be difficult to define. What may appear as an immediate detriment, over time may actually become a benefit. For example, in a forest community, uprooting of trees by fast flowing water (an immediate detriment) creates gaps in the canopy, allowing light penetration and new trees to grow in these gaps, thus strengthening and benefiting the overall continuity of the plant community. In a community with different species competing for shared resources, inundation can kill species intolerant to flooding while not affecting more tolerant species.

On rivers such as the Mississippi and its tributaries, impacts of flooding on channelized, leveed, or dammed rivers could be expected to be higher because the water can not readily disperse into the floodplain (Horne & Goldman, 1994). Species occurring in the controlled areas are less likely to be adapted to flooding due to the infrequency of flooding events. These species are able to reside in the controlled areas because the natural fluctuations of the riverine system have been changed as a result of human intervention. These species are more likely to be affected by flooding than species which are adapted to fluctuations in the riverine system.

Following is a discussion of the effects of flooding on vegetation, terrestrial wildlife, and aquatic life. The discussions cover both the beneficial and detrimental effects of flooding.

4.1 VEGETATION

4.1.1 Beneficial Effects

The effects of flooding on vegetation are beneficial to species endemic to terrestrial bottomlands because flooding can reduce competition from non-native species and species which are intolerant to flooding. For example, the flood of 1993 benefitted some of the native marsh vegetation in the Mississippi region by suppressing purple loosestrife, an invading weed which has been displacing native species (Gutin, 1994). Following the flood, lotus and white water lily became the dominant submerged vegetation in some areas because they were able to adapt to the deeper water conditions (Gent and Blackburn; Langrehr and Dukerschein; Redmond and Nelson, 1994).

Flooding can create new opportunities for pioneer species to regenerate (Yin et al., 1994). The flood water aided in dispersal of oak, hickory, and other seeds to new areas of the floodplain (Allen, 1993). Some species decreased in number where they typically had been observed; however, they were observed in locations where they previously had not been found (Langrehr and Dukerschein, 1994). In the summer of 1994, first-year seedlings were abundant (Yin, et al, 1994).

Flooding can reduce the understory of floodplain forests, facilitating the growth and rejuvenation of bottomland species into mature bottomland plant communities. Uprooting and felling of trees creates barren areas for new vegetative growth. In areas where vegetation had been killed and sediments had been deposited by the flood of 1993, researchers found seedlings of species which ordinarily occur only on unvegetated mud flats or unvegetated channel borders (Yin, et al, 1994).

4.1.2 Detrimental Effects

Yin, et al. (1994) found substantial tree mortality in the floodplain forests of the Upper Mississippi River System (UMRS) as a result of the flood of 1993. Many trees failed to leaf out in the spring of 1994. Mortality rates increased progressively (from 1 to 37 percent for trees and from 2 to 80 percent for saplings) from the headwaters to the confluence with the Missouri River. Juvenile trees were severely damaged throughout the UMRS. From Pool 17 downstream to St. Louis, 18 to 37 percent of canopy trees were killed; 70 to 80 percent of the saplings, were also killed; and nearly all of the smaller juvenile trees were killed. Mortality rates depended on each species tolerance of flooding; the relative flood tolerances of selected tree and shrub species are listed in Table 4-1. Irrespective of species, mortality was most pronounced among trees with a diameter at breast height of less than 10 centimeters. In terms of tree density and species composition, the effects of the 1993 flood on the floodplain forests will last for decades (Yin, et al, 1994).

Some trees may die from flood-related stress several years after a flood. Many birds use trees in the riparian habitat for nesting. The 1993 flood toppled many of the oldest, tallest cottonwoods which are favored roosts of the bald eagle (Gutin, 1994).

The diversity and frequency of submersed plant communities declined after the flood of 1993 (Redmond and Nelson; Gent and Blackburn, 1994). Submersed plants perform several functions in an aquatic community. They are primary producers, water velocity modifiers, sediment stabilizers, and a source of food and habitat (Redmond and Nelson, 1994).

Table 4-1
RELATIVE FLOOD TOLERANCES OF SELECTED TREE AND SHRUB SPECIES
IN THE UPPER MISSISSIPPI RIVER AND FLOODPLAIN SYSTEM

Common name	Very tolerant	Tolerant	Somewhat tolerant	Intolerant
Black willow	x			
Buttonbush	x			
Peach leaf willow	x			
Pecan	x			
Sandbar willow	x			
Swamp-privet	x			
Box elder	x	x		
Green Ash	x	x		
Cottonwood		x		
False indigo		x		
Northern swamp dogwood		x		
Persimmon		x		
Red osier dogwood		x		
Round leaf dogwood		x		
Silver maple		x		
Slippery elm		x		
Sycamore		x		
White ash		x		
American elm		x	x	
Nannyberry		x	x	
Pawpaw		x	x	
Pin oak		x	x	
River birch		x	x	
Bur oak			x	
Honey-locust			x	
Prickly ash			x	
Swamp white oak			x	
Basswood				x
Bitternut hickory				x
Black locust				x
Black oak				x
Black walnut				x

Table 4-1
(continued)

Common name	Very tolerant	Tolerant	Somewhat tolerant	Intolerant
Butternut				x
Hackberry				x
Kentucky coffeetree				x
Northern red oak				x
Red mulberry				x
Red pine				x
Redbud				x
Sassafras				x
Scotch pine				x
Sugarberry				x
White mulberry				x
White oak				x
Wild black cherry				x

Source: Yin et al., 1994

4.2 TERRESTRIAL WILDLIFE

4.2.1 Beneficial Effects

The impacts of flooding on terrestrial wildlife can be beneficial to species adapted to these environments because their habitat can be improved by the influx of nutrients brought into the system by flooding waters. Severe flooding may reduce competition for native riverine species, resulting in an increase in their populations. Predatory species of the riverine environment could also thrive by feeding on fish trapped in shallow areas. Wading or predatory species of birds which would benefit include shorebirds, herons, egrets, bald eagles, and hawks. Mammals such as raccoons and mink likewise benefitted.

4.2.2 Detrimental Effects

Although wading birds benefitted, other bird species such as the endangered least tern had many nests swept away by the rising waters of the flood of 1993 (Allen, 1993). The flood also disrupted attempts at improving wildlife by inundating the 6,600-acre Ted Shanks Conservation area in Missouri, according to Wildlife Area Manager, Phil Covington (Allen, 1993). Instead of having 19 separately managed units, that area became a large pool with water up to 20 feet deep in areas. This water impacted waterfowl directly because few species can feed in water over ten inches deep. The flood destroyed food for birds that use the Mississippi River as a migration route such as the mallard, the most abundant duck in the Mississippi flyway, which relies on the seeds of native plants and on corn left in fields after harvest (Allen, 1993).

For non-mobile animals that cannot escape to higher ground, population levels can show immediate decreases due to drowning mortalities. Wildlife such as voles, mice, rats, shrews, rabbits and squirrels which may not escape rising waters would show decreases but could be expected to rebound quickly because of high reproductive rates. Larger, mobile species such as deer, bear, coyote, fox, raccoon and opossum would be expected to flee advancing floodwaters. Those species that are displaced may have difficulty in adapting to other habitats, especially if they are endemic to the riverine systems. Impacts to wildlife adjacent to leveed streams could be affected more because of the possibility of levee breaches or breaks where there is a swift influx of water. In an unregulated river, water levels generally rise gradually to flood stages and animals have a longer time period to escape rising water.

The few studies regarding the effects of flooding on snakes reported unusual movements or numbers of snakes during a flood (Tucker, 1994). Beginning in October 1993, after the flood had passed, Tucker (1994) observed an unusually large number of road-kill snakes in an area that had been covered by the flood. The flood likely altered the nature of the riprap along the road by depositing silt in the interspaces of the riprap, thus filling the hibernation habitat of the snakes. Therefore, the snakes may have been forced to cross the road to locate suitable hibernation habitat.

4.3 AQUATIC LIFE

4.3.1 Beneficial Effects

The amount of sediment, leaf litter and detritus entering a waterway would increase during a flood event. These materials are a source of nutrients for invertebrate communities. Therefore an increase in invertebrate productivity would be expected. The invertebrate communities are a valuable source of food fishes and protein for waterfowl. Studies performed by Theiling, et al. (1994) found that as the 1993 flood waters receded, invertebrate densities at the shoreline dropped but species diversity increased. Invertebrate communities were much denser on flooded land and where aquatic vegetation was present than in open water.

Flooding is beneficial to many riverine fish species. The reproductive success of some fish species is dependent on the timing and duration of flooding. During floods, fish move into the floodplain to feed and to spawn. Maher (1994) found that during 1993, flooded floodplains had a higher diversity and number of fishes than did aquatic areas in previous years. Reproductive success was also higher than it had been in the river during previous years. Apparently, flooded land is important for spawning and rearing many fish species.

During the 1993 flood the inundated farms and pastures became some of the most active areas of biological activity. Fish such as the American paddlefish, found only in the Mississippi River and its tributaries, reproduce best in very high and fast-moving water such as that which occurred in the flood of 1993 (Allen, 1993).

Data collected by the Onalaska, Wisconsin and West Alton, Illinois field stations suggest the flood had positive effects on the number of fish species. The presence of two previously unencountered migratory fish species (skipjack herring and rainbow smelt) near LaCrosse, Wisconsin, was likely related to flooding; the higher water level enabled them to swim through lock and dam locations. Skipjack herring were captured in areas where they had not been seen for many years. Skipjack herring host the larva of the ebonyshell pearly mussel, whose numbers had declined in northern pools as the number of skipjack herring decreased (Bartels and Dukerschein, 1994).

4.3.2 Detrimental Effects

The immediate impact on the aquatic habitat is due to the scouring action of the water. In minor floods, silt is removed from the cobble and gravel on the stream bed and deposited downstream or in the floodplain, improving habitat for invertebrate communities. In more severe floods, the scouring action of the stream is greater. Thus, larger size cobble and gravel are displaced, disrupting the aquatic habitat of the streambed. For the invertebrate and vertebrate communities this immediate disruption in habitat can be serious unless they find other suitable habitat. No adverse effects on mussel beds were reported from the 1993 flooding, however.

Flooding can result in an increase in the number of pest species such as mosquitoes due to the increase in habitat available to them for laying eggs. Another pest species present in the study area is the zebra mussel. Their population levels are expected to increase significantly from the flooding because it allowed the mussel to migrate into tributaries and inundated areas, expanding its range (Bhowmik, et al, 1993).

4.4 References Cited

- Allen, W. H. 1993. *The Great Flood of 1993, effects of the Missouri and Mississippi Rivers' flooding on animals and plants*. Bioscience, December 1993, 43(11): 732-738.
- Bartels, A. and Dukerchein, J. T. 1994. *A Summary of Fisheries Changes Observed in Pool 8 of the Upper Mississippi River System During and Following the Flood of 1993*. Wisconsin Department of Natural Resources in National Biological Service, et al., 1994.
- Bhowmik, N. G., et al., 1993. *The 1993 Flood on the Mississippi River in Illinois, Illinois State Water Survey*. Miscellaneous Publication 151. Champaign, IL.
- Gent, R. and Blackburn, T. 1994. *Observations of Aquatic Macrophyte Abundance in Mississippi River Pool 13 During the Flood of 1993*. Iowa Department of Natural Resources, Mississippi River Monitoring Station in National Biological Service, et al., 1994.
- Gutin, J. 1994. *Life in the Mississippi, effect of the 1993 flood on plant and animal life*. Discover, January 1994, 15(1): 64-66.
- Horne, A. J. and Goldman, C. R. 1994. *Limnology*, 2nd Ed., McGraw-Hill, Inc. pp.551
- Langrehr, H. and Dukerschein, J. T. 1994. *A Summary of Vegetation Changes Observed in Pool 8 of the Upper Mississippi River System During and Following the Flood of 1993*. Wisconsin Department of Natural Resources in National Biological Service, et al., 1994.
- Maher, R. 1994. *Observations of Fish Community Structure and Reproductive Success in Flooded Terrestrial Areas During an Extreme Flood on the Lower Illinois River*. Illinois Natural History Survey in National Biological Service, et al., 1994.
- National Biological Service, et al., 1994. *Long Term Resource Monitoring Program, 1993 Flood Observations*.
- Redmond, A. and Nelson, J. 1994. *Observations of Submersed Aquatic Vegetation in Three Backwater Lakes of the Lower Illinois River Before and After the 1993 Flood*. Illinois Natural History Survey. National Biological Service, et al., 1994.
- Theiling, C., et al. 1994. *Nektonic Invertebrate Distribution and Abundance During Prolonged Summer Flooding on the Lower Illinois River*. Illinois Natural History Survey. National Biological Service, et al., 1994.
- Tucker, J. 1994. *Notes on Road-Killed Snakes and Correlations with Habitat Modification Due to Summer Flooding on the Mississippi River in West Central Illinois*. Illinois Natural History Survey in National Biological Service, et al., 1994.
- Yin, Y., et al. 1994. *Tree Mortality in the Upper Mississippi River and Floodplain Following an Extreme Flood in 1993* in National Biological Service, et al., 1994.

5.0 DATA SOURCES

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- Boland, T. and McCarthy, T. 1992. *Mississippi and Missouri Rivers Commercial Fishing Report*, 1992.
- Eckbald, J.W. 1986. *The Ecology of Pools 11-13 of the Upper Mississippi River: A Community Profile*. U.S. Department of Interior and U.S. Department of the Army.
- Fleener, C. and Gogel, G. 1977. *Minnesota River Facilities Guide - Minneapolis, Minnesota to the Mouth of the Ohio River*. Upper Mississippi River Conservation Committee.
- Fleener, G.C. 1989. *Recreational Use Survey of the Missouri River*. Dingell Johnson Project F-1-R-38. Study S-32. Missouri Department of Conservation. Jefferson City, MO.
- Giace, T.B. and Pflieger, W.L. 1989. *Common and Scientific Names of Fishes of the Missouri River*. Unpublished Report Missouri Department of Conservation, Columbia, MO.
- Hesse, L.W. 1994. *Flora and Fauna of the Missouri River Downstream from the Fort Randall Dam to the Mouth as they Relate to the Alteration of the Hydrosystem*.
- Illinois Natural Heritage Inventory. 1994. *Database Search*. Illinois Department of Conservation, Springfield, Ill.
- Iowa Natural Heritage Inventory. 1994. *Database Search*. Bureau of Preserves and Ecological Services, Department of Natural Resources, Des Moines, IA.
- Kansas Natural Heritage Inventory. 1994. *Database Search*. Kansas Biological Survey. Lawrence, KS.
- Küchler, A. W. 1975. *Potential Natural Vegetation of the Conterminous United States*. American Geographical Society, NY, NY.
- Minnesota Natural Heritage Inventory. 1994. *Database Search*. Department of Natural Resources. St. Paul, MN.
- Missouri Natural Heritage Inventory. 1994. *Database Search*. Missouri Department of Conservation, Jefferson City, MO.
- National Biological Survey. 1994. *Database Search for Government Management Areas and Environmentally Sensitive Areas Along the Upper Mississippi River*. Long Term Resource Monitoring Program, Environmental Management Technical Center, Onalaska, WI.
- National Biological Survey, Illinois Natural History Survey, Iowa Department of Natural Resources, and Wisconsin Department of Natural Resources. 1994. *Long Term Resource Monitoring Program 1993 Flood Observations*. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1994. LTRMP 94-S011. 190 pp.

National Oceanic and Atmospheric Administration. 1994. *National Disaster Survey Report; The Great Flood of 1993*.

National Park Service. 1994. *Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance*.

Nebraska Natural Heritage Inventory. 1994. *Database Search*. Game and Parks Commission. Lincoln, NE.

North Dakota Natural Heritage Inventory. 1994. *Database Search*. Department of Parks and Recreation. Bismarck, NC.

Peterson, G. A. 1984. *Inventory for the Upper Mississippi River (Guttenberg, Iowa to Saverton, Missouri)*. Prepared for U.S. Army Corps of Engineers, Rock Island District, Rock Island, Illinois.

Riley, L. and Riley, W. 1993. *Guide to the National Wildlife Refuges*. MacMillan Publishing Company. New York, NY.

Scientific Assessment and Strategy Team (SAST). 1994. *Flood Boundary File*. Provided by U.S. Army Corps of Engineers. St. Paul District. St. Paul, MN.

South Dakota Natural Heritage Inventory. 1994. *Database Search*. Department of Game, Fish and Parks. Pierre, SD.

Talkington, L.M. 1991. *The Illinois River*. University of Illinois at Urbana-Champaign, Division of Printing Services.

Theiling, C.H. 1993. *An Ecological Overview of the Upper Mississippi River System: Implications for Post Flood Recovery*. Appendix 1-4. Prepared for SAST. Sioux Falls, SD.

Thom, R.H. and Iffrig, G. 1985. *Directory of Missouri Natural Areas*. Missouri Department of Conservation. Jefferson City, MO.

U.S. Army Corps of Engineers. *Missouri River Flood Plain Atlas - Land Use and Land Cover Data*. Kansas City, District, Kansas City, MO.

U.S. Army Corps of Engineers. 1980. *A Study of the Upper Mississippi River - Great River Environmental Action Team (Great I)*. St. Paul, MN.

U.S. Army Corps of Engineers. 1993. *Missouri Master Water Control Manual; Review and Update Study, Volume 7F: Environmental Studies*. Missouri River Division.

U.S. Army Corps of Engineers. 1983. *Upper Mississippi River Land Use Allocation Plan. Master Plan for Public Use Development and Resource Management Part I and Part II*, St. Paul District, St. Paul, MN.

U.S. Army Corps of Engineers. 1993. *Missouri River Master Water Control Manual. Review and Update Study. Volume 7F. Environmental Studies*.

Floodplain Management Assessment

- U.S. Army Corps of Engineers. 1994. *The Great Flood of 1993; Post-Flood Report, Upper Mississippi River Basin*. St. Louis District, St. Louis, MO.
- U.S. Army Corps of Engineers. 1994. *The Great Flood of 1993; Post-Flood Report, Upper Mississippi River Basin, (Draft)*. Rock Island District, Rock Island, Illinois.
- U.S. Army Corps of Engineers. 1994. *The Great Flood of 1993; Post-Flood Report, Lower Missouri Basin*. Kansas City District.
- U.S. Department of Agriculture. 1981. *Land Resources and Major Land Resource Areas of the United States*. Soil Conservation Service. Washington, D.C.
- U.S. Department of Agriculture and U.S. Department of Interior. 1983. *Des Moines River Basin Study Environmental Corridors*. Soil Conservation Service and Forest Service. Des Moines, Iowa.
- U.S. Department of Agriculture. 1993. *Natural Vegetation South Dakota*. Soil Conservation Service, National Cartography & GIS Center, Fort Worth, TX.
- U.S. Soil Conservation Service. 1994. *State Soil Geographic Database (STATSGO)*. Provided by SAST. EROS Data Center. Sioux Falls, SD.
- U.S. Fish and Wildlife Service. 1976-1992. *The Upper Mississippi River Wildlife and Fish Refuge, Pools 4-14 Maps*. U.S. Department of Interior, Washington, D.C.
- U.S. Fish and Wildlife Service. 1987. *Resource Classification System, Upper Mississippi National Wildlife and Fish Refuge*. U.S. Department of Interior.
- U.S. Fish and Wildlife Service. 1988. *Desoto National Wildlife Refuge. Concept Plan*. U.S. Department of Interior.
- U.S. Fish and Wildlife Service. 1978. *Stream Evaluation Map, State of Nebraska*. Denver, CO.
- U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources. 1984. Minnesota Valley, *National Wildlife Refuge, Recreation Area and State Trail; Comprehensive Plan*.
- U.S. Fish and Wildlife Service. 1994. *National Wetland Inventory Maps, 1:24,000 Scale Digital Files*. Provided by SAST, EROS Data Center, Sioux Falls, SD.
- U.S. Geological Survey. 1994. *1:100,000 Scale Quadrangles, Land Use/Land Cover Data, DLG Files*. Provided by SAST, EROS Data Center, Sioux Falls, SD.
- U.S. Geological Survey. 1994. *1:100,000 Scale Quadrangles, Hydrography Data, DLG Files*. Provided by SAST, EROS Data Center, Sioux Falls, SD.
- Wisconsin Natural Heritage Inventory. 1994. *Database Search*. Department of Natural Resources. Madison, WI.

APPENDIX A
SOIL ASSOCIATIONS OF THE
UPPER MISSISSIPPI RIVER BASIN

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SOIL ASSOCIATIONS OF THE UPPER MISSISSIPPI RIVER BASIN

This appendix shows state soil associations with their corresponding STATSGO soil association. This was accomplished by visually relating state soils associations, provided as maps by each state, with the STATSGO computer based information. The soil types in each state were searched by reaches on STATSGO and matched with state soil association maps. This appendix provides the various soil types referenced by state with the corresponding STATSGO soil associations and identification numbers.

Two potential areas of error were involved in this process. First, the accuracy and scale of maps provided by each state made relations between the two sources difficult to determine. In addition, it was difficult to correlate from one source to the other. In general, the STATSGO data was based on smaller areas than the states. Therefore, each state soil association overlapped with several STATSGO associations. The STATSGO associations also occurred within more than one state association. The state soils associations and the corresponding STATSGO associations are listed below, with the state descriptions. STATSGO does not provide descriptions in their data.

ILLINOIS SOILS

Soil Association: Lawson-Sawmill-Darwin

Corresponding STATSGO Soil Association(s):

Beaucop-Lawson-Darwin (IL029)
Dorchester-Wakeland-Beavercreek (IL067)
Haynie-Waldron-Blake (IL080)
Karnak-Jacob-Cairo (IL027)
Palsgrove-Dubuque-Fayette (IL059)
Rozetta-Fayette-Hickory (IL034)
Seaton-Hickory-Mt. Carroll (IL032)
Seaton-Lacrescent-Lawson (IL031)
Wakeland-Birds-Belknap (IL068)
Sawmill-Genessee-Lawson (IL028)

Description: Dark and moderately dark (prairie) - Stratified clayey to sandy alluvial sediments on bottomlands, nearly level to gently sloping.

Soil Association: Markland-Colp-Del Rey

Corresponding STATSGO Soil Association(s):

Del Rey-Milford-Saylesville (IL052)
Dorchester-Wakeland-Beavercreek (IL067)
Hurst-Reesville-Patton (IL051)
Wakeland-Birds-Belknap (IL068)

Description: Light and moderately dark (forest) - Loamy, silty and clayey, Wisconsinan lacustrine sediments.

Soil Association: Seaton-Timula

Corresponding STATSGO Soil Association(s):

Del Rey-Milford-Saylesville (IL052)
Dorchester-Wakeland-Beavercreek (IL067)
Port Byron-Joy-Seaton (IL001)
Seaton-Hickory-Mt. Carroll (IL032)
Seaton-Lacrescent-Lawson (IL031)

Description: Light and moderately dark (forest) - Thick loess (> 60 in.).

Soil Association: Plano-Proctor-Worthen

Corresponding STATSGO Soil Association(s):

Drummer-Plano-Elburn (IL012)
Gilford-Maumee-Sparta (IL024)
Port Byron-Joy-Seaton (IL001)
Rozetta-Fayette-Hickory (IL034)
Seaton-Lacrescent-Lawson (IL031)
Wakeland-Birds-Belknap (IL068)
Worthen-Littleton-Elburn (IL013)
Sawmill-Genessee-Lawson (IL028)

Description: Dark and moderately dark (prairie) - Thin loess (10-40 in.) on loam or sandy loam, Wisconsin till, on nearly level to sloping glacial outwash plains and alluvial terraces.

Soil Association: Middletown-Tell-Thebes

Corresponding STATSGO Soil Association(s):

Seaton-LaCrescent-Lawson (IL031)
Tell-Lamont-Port Byron (IL040)

Description: Light and moderately dark (forest) - Moderately thick to thin loess (20-60 in.) on Aeolian, Wisconsin loamy sands or sands, on nearly level to strongly sloping landscape positions.

Soil Association: Houghton-Palms-Muskego

Corresponding STATSGO Soil Association(s):

Houghton-Lena-Muskego (IL030)

Description: Dark and moderately dark (prairie) - Organic materials (peats and mucks), on nearly level to strongly sloping areas.

Soil Association: Port Byron-Joy

Corresponding STATSGO Soil Association(s):

Port Byron-Joy-Seaton (IL001)
Waukegan-Richwood-Joy (IL008)

Description: Dark and moderately dark (prairie) - Thick loess (> 60 in.), on nearly level to strongly sloping areas.

Soil Association: Fayette-Rozetta-Stronghurst

Corresponding STATSGO Soil Association(s):

Rozetta-Fayette-Hickory (IL034)

Rozetta-Keomah-Hickory (IL036)

Description: Light and moderately dark (forest) - thick loess (> 60 in.)

Soil Association: Sparta-Dickinson-Onarga

Corresponding STATSGO Soil Association(s):

Beaucop-Lawson-Darwin (IL029)

Gilford-Maumee-Sparta (IL024)

Worthen-Littleton-Elburn (IL013)

Description: Dark and moderately dark (prairie) - Thick, sandy, Wisconsinan outwash and Aeolian materials, occurring on nearly level to moderately steep slopes.

Soil Association: Alford-Muren-Iva

Corresponding STATSGO Soil Association(s):

Alford-Muren-Hickory (IL035)

Description: Light and moderately dark (forest) - Thick loess (> 60 in.).

Soil Association: Martinsville-Sciotoville

Corresponding STATSGO Soil Association(s):

Emma-Sexton-Martinsville (IL054)

Description: Light and moderately dark (forest) - Thin silty or loamy materials on sandy and loamy, Wisconsinan outwash.

Soil Association: Alford-Goss-Baxter

Corresponding STATSGO Soil Association(s):

Alford-Seaton-Hickory (IL061)

Goss-Alford-Baxter (IL060)

Description: Light and moderately dark (forest) - Thin to thick loess or loamy materials with or without residuum on limestone, occurring on steep and strongly dissected upland areas.

Soil Association: Alford-Wellston

Corresponding STATSGO Soil Association(s):

Alford-Wellston-Wakeland (IL062)

Description: Light and moderately dark (forest) - Thin to thick loess or loamy materials with or without residuum on interbedded sandstone, siltstone, and shale, occurring on steep and strongly dissected upland areas.

Soil Association: Hosmer-Zanesville-Berks

Corresponding STATSGO Soil Association(s):

Hosmer-Zanesville-Belknap (IL063)

Description: Light and moderately dark (forest) - Thin to thick loess or loamy materials with or without residuum on interbedded sandstone, siltstone, and shale, on slopes ranging from nearly level to steep.

Soil Association: Haymond-Petrolia-Karnak

Corresponding STATSGO Soil Association(s):

Alford-Wellston-Wakeland (IL062)

Bonnie-Belknap-Piopolis (IL069)

Hosmer-Zanesville-Belknap (IL063)

Rozetta-Fayette-Hickory (IL034)

Wakeland-Birds-Belknap (IL068)

Description: Dark and moderately dark (prairie) - Sandy to clayey alluvial sediments on bottomlands, occurring on nearly level to gently sloping areas.

Soil Association: Oakville-Lamont-Alvin

Corresponding STATSGO Soil Association(s):

Alvin-Ruark-Roby (IL055)

Bonnie-Belknap-Piopolis (IL069)

Emma-Sexton-Martinsville (IL054)

Hurst-Reesville-Patton (IL051)

Plainfield-Bloomfield-Sparta (IL056)

Plainfield-Sparta-Oakville (IL071)

Rozetta-Fayette-Hickory (IL034)

Worthen-Littleton-Elburn (IL013)

Description: Light and moderately dark (forest) - Thick, sandy, Wisconsin outwash and Aeolian materials, occurring on nearly level to very steep terraces and on uplands.

IOWA SOILS

Soil Association: Colo-Zook-Nodaway

Corresponding STATSGO Soil Association(s):

Coland-Wadena-Havelock (IA119)
Colo-Calco-Kennebec (IA098)
Colo-Nodaway-Zook (IA057)
Dorchester-Chaseburg-Colo (IA010)
Downs-Fayette-Chaseburg (IA002)
Fayette-Nordness-Rock Outcrop (IA005)
Fayette-Rozetta-Eleroy (IA009)
Fruitfield-Elrick-Toolesboro (IA130)
Gara-Armstrong-Pershing (IA041)
Ida-Hamburg-Napier (IA072)
Kennebec-McPaul-Nodaway (IA083)
Kennebec-McPaul-Nodaway (IA088)
Ladoga-Gara-Armstrong (IA053)
Ladoga-Givin-Hedrick (IA032)
Luton-Salix-Keg (IA085)
Marna-Guckeen-Kilkenny (IA116)
Marshall-Exira-Shelby (IA064)
Marshall-Nevin-Minden (IA062)
Monona-Ida-Napier (IA070)
Nodaway-Colo-Zook (IA063)
Nodaway-Lawson-Colo (IA044)
Otley-Adair-Ladoga (IA031)
Sharpsburg-Shelby-Colo (IA051)
Sparta-Dickinson-Chelsea (IA124)
Tama-Killduff-Colo (IA022)
Titus-Wabash-Rowley (IA132)

Description: Nearly level and gently sloping (0-5%) prairie-derived soils developed from alluvium. Soils on steep adjacent upland slopes are included in some areas.

Soil Association: Wadena-Talcot-Ridgeport

Corresponding STATSGO Soil Association(s):

Clarion-Nicolett-Webster (IA110)
Coland-Storden-Hayden (IA119)
Hayden-Lester-Storden (IA115)
Marna-Guckeen-Kilkenny (IA116)
Wadena-Harcot-Biscay (IA099)

Description: Nearly level and gently sloping (0-5%) prairie-derived upland and terrace soils developed from alluvium.

Soil Association: Clinton-Lindley-Keswick

Corresponding STATSGO Soil Association(s):

Clinton-Lindley-Keswick (IA033)

Description: Moderately sloping to very steep (5-30%) forest-derived soils developed from loess, pre-Wisconsin till, or pre-Wisconsin till-derived paleosols.

Soil Association: Otley-Mahaska-Ladoga-Clinton-Adair

Corresponding STATSGO Soil Association(s):

Otley-Adair-Ladoga (IA031)

Downs-Tama-Fayette (IA004)

Tama-Killduff-Colo (IA022)

Description: Nearly level to strongly sloping (0-14%) prairie to forest-derived soils developed from loess, pre-Wisconsin till-derived paleosols, or pre-Wisconsin till.

Soil Association: Tama-Dinsdale-Kenyon

Corresponding STATSGO Soil Association(s):

Downs-Tama-Fayette (IA004)

Dinsdale-Tama-Klinger (IA024)

Description: Gently to strongly sloping (2-14%) prairie-derived soils developed from loess, loess over pre-Wisconsin till, or pre-Wisconsin till on the Iowan Erosion Surface.

Soil Association: Tama-Muscatine

Corresponding STATSGO Soil Association(s):

Tama-Muscatine-Garwin (IA020)

Description: Nearly level to moderately sloping (0-9%) prairie-derived soils developed from loess.

Soil Association: Tama-Dinsdale-Downs

Corresponding STATSGO Soil Association(s):

Tama-Killduff-Colo (IA022)

Description: Gently to moderately sloping (2-9%) prairie or mixed prairie, forest-derived soils developed from loess or loess over pre-Wisconsin till on the Iowan Erosion Surface.

Soil Association: Clarion-Nicollet-Storden-Webster

Corresponding STATSGO Soil Association(s):

Canisto-Nicollet-Clarion (IA111)

Clarion-Nicollet-Webster (IA110)

Clarion-Storden-Nicollet (IA114)

Description: Nearly level to moderately sloping (0-9%) prairie-derived soils developed from Wisconsin till on the Cary Lobe. Includes very poorly-drained depressional soils.

Soil Association: Hayden-Lester

Corresponding STATSGO Soil Association(s):

Hayden-Lester-Storden (IA115)

Marna-Guckeen-Kilkenny (IA116)

Description: Nearly level to very steep (0-40%) forest and mixed prairie-forest-derived soils developed from Wisconsin till on the Cary Lobe. Includes some soils on bottomlands and terraces.

Soil Association: Fayette-Nordness (with areas of Dubuque and Dorchester)

Corresponding STATSGO Soil Association(s):

Dorchester-Chaseburg-Colo (IA010)

Fayette-Nordness-Rock Outcrop (IA005)

Fayette-Rozetta-Eleroy (IA009)

LaCrescent-Elbaville-Lamoille (IA007)

Description: Nearly level to steep (0-40%) forest-derived soils developed from loess or loess over bedrock and adjacent areas that are too small to delineate.

Soil Association: Sparta-Dickinson-Chelsea-Waukee

Corresponding STATSGO Soil Association(s):

Fruitfield-Elrick-Toolesboro (IA130)

Nodaway-Lawson-Colo (IA044)

Sparta-Dickinson-Chelsea (IA124)

Description: Nearly level to gently sloping (0-5%) prairie to forest-derived, mostly moderately coarse-textured soils on terraces.

Soil Association: Finchford-Sparta

Corresponding STATSGO Soil Association(s):

Fruitfield-Elrick-Toolesboro (IA130)

Description: Nearly level to gently sloping (0-5%) prairie-derived, coarse-textured soils on terraces.

Soil Association: Lindley-Weller

Corresponding STATSGO Soil Association(s):

Lindley-Weller-Keswick (IA042)

Description: Gently sloping to steep (2-25%) forest-derived soils developed from pre-Wisconsin till or loess.

Soil Association: Fayette-Dubuque

Corresponding STATSGO Soil Association(s):

Dorchester-Chaseburg-Colo (IA010)

Fayette-Nordness-Rock Outcrop (IA005)

Fayette-Rozetta-Eleroy (IA009)

Tama-Downs-Atterberry (IA021)

Description: Gently and moderately sloping (2-9%) forest-derived soils developed from loess on ridgetops and loess over pre-Wisconsin till or loess over bedrock on moderately steep and steep (14-25%) sideslopes.

Soil Association: Fayette-Lindley

Corresponding STATSGO Soil Association(s):

Dorchester-Chaseburg-Colo (IA010)

Description: Gently sloping to steep (2-25%) forest-derived soils developed from loess or pre-Wisconsin till.

Soil Association: Webster-Okoboji-Canisteo-Clarion-Nicollet-Harps

Corresponding STATSGO Soil Association(s):

Canisteo-Nicollet-Clarion (IA111)

Description: Nearly level and gently sloping (0-5%) prairie-derived soils developed from Wisconsin till on the Cary Lobe. Depressional and calcareous soils are common.

MINNESOTA SOILS

Soil Association: Colo-Kalmarville-Minneiska

Corresponding STATSGO Soil Association(s):

Chaska-Minneiska-Colo (MN165)
Copaston-Chaska-Minneiska (MN153)
Dickman-Sparta-Estherville (MN157)
Erin-Kilkenny-Boots (MN167)
Estherville-Dickman-Dakota (MN168)
Estherville-Waukegan-Dickinson (MN229)
Etter-Rockton-Copaston (MN178)
Hubbard-Sparta-Plainfield (MN180)
Kingsley-Mahtomedi-Quam (MN172)
Lester-Hawick-Terril (MN171)
McPaul-Radford-Zumbro (MN468)
Ostrander-Baytown-Ripon (MN185)
Sparta-Copaston-Burkhardt (MN182)
Sparta-Estherville-Waukegan (MN169)
Timula-Frontenac-Seaton (MN233)
Waukegan-Baytown-Ripon (MN186)
Waukegan-Wadena-Hawick (MN173)

Description: Formed in silty and loamy alluvium on nearly level floodplains, in the Lower Minnesota River Valley.

Soil Association: Coland-Storden-Swanlake

Corresponding STATSGO Soil Association(s):

Chaska-Minneiska-Colo (MN165)
Coland-Clarion-Shorewood (MN458)
Copaston-Chaska-Minneiska (MN153)
Dickman-Sparta-Estherville (MN157)
Lester-Hawick-Terril (MN171)
Lester-LeSueur-Cordova (MN079)

Description: Formed in sandy to clayey alluvial on nearly level bottomlands and steep side slopes in the Upper Minnesota River Valley.

Soil Association: Seaton-LaCrescent-Arenzville

Corresponding STATSGO Soil Association(s):

Comfrey-Shiloh (MN467)
Estherville-Waukegan-Dickinson (MN229)
LaCrescent-Elbaville-Lamoille (MN237)
Minneiska-Rawles-Becker (MN238)
Moundprairie-Kalmarville-Rawles (MN291)
Plainfield-Rawles-Minneiska (MN223)
Seaton-Newalbin-Festina (MN227)
Seaton-Newglarus-Palsgrove (MN236)
Sparta-Estherville-Waukegan (MN169)

Description: Formed in silty loess, alluvial and colluvial sediments on nearly level to very steep loess covered uplands, side slopes and floodplains in southeastern Minnesota.

Soil Association: Lester-LeSueur-Cordova

Corresponding STATSGO Soil Association(s):

Lester-LeSueur-Cordova (MN079)

Description: Formed in calcareous loamy glacial till on nearly level ground moraines and till plains in south-central Minnesota.

Soil Association: Barnes-Flom-Buse

Corresponding STATSGO Soil Association(s):

Lester-Kilkenny-Houghton (MN152)

Description: Formed in calcareous loamy glacial till on steep to nearly level moraines in western Minnesota.

Soil Association: Wadena-Estherville-Waukegan

Corresponding STATSGO Soil Association(s):

Estherville-Dickman-Dakota (MN168)
Waukegan-Baytown-Ripon (MN186)

Description: Formed in silty and loamy alluvium or in loess overlying sandy and gravelly sediments on nearly level to steep outwash plains, valley trains, kames, and glacial moraines in central Minnesota.

Soil Association: Kingsley-Mahtomedi-Santiago

Corresponding STATSGO Soil Association(s):

Antigo-Chetek-Mahtomedi (MN470)

Santiago-Kingsley-Demontreville (MN184)

Waukegan-Baytown-Ripon (MN186)

Waukegan-Wadena-Hawick (MN173)

Description: Formed in loamy glacial till, sandy and gravelly outwash, and in a moderately thick covering of silty loess over glacial till. Occurs on undulating to hill ground moraines and outwash plains in eastern and central Minnesota.

MISSOURI SOILS

Soil Association: Westerville-Fatima-Wabash

Corresponding STATSGO Soil Association(s):

Carlow-Portage-Chequest (MO027)
Fatima-Arbela-Vesser (MO029)
Goss-Pembroke-Union (MO060)
Haymond-Wilbur-Freeburg (MO058)
Haynie-Waldron-Blake (MO065)
Hildebrecht-Weingarten-Goss (MO094)
Landes-Sparta-Excello (MO030)
Lily-Minnith-Jonica (MO057)
Lindley-Keswick-Goss (MO018)
Lomax-Blase-Booker (MO026)
Menfro-Winfield-Weller (MO021)
Nodaway-Lawson-Colo (MO024)

Description: Deep, nearly level to very steep, well-drained and moderately well-drained loamy upland soils and nearly level loamy bottomland soils.

Soil Association: Menfro-Winfield-Lindley

Corresponding STATSGO Soil Association(s):

Menfro-Winfield-Weller (MO021)
Haymond-Dockery-Moniteau (MO028)

Description: Deep, gently sloping to steep, well-drained and moderately-drained, loamy upland soils.

Soil Association: Haynie-Blake-Booker

Corresponding STATSGO Soil Association(s):

Albaton-Onawa-Haynie (MO035)
Haymond-Dockery-Moniteau (MO028)
Haynie-Waldron-Blake (MO065)
Lomax-Blase-Booker (MO026)
Luton-Salix-Keg (MO002)
Menfro-Winfield-Haymond (MO055)
Menfro-Winfield-Weller (MO021)
Urban Land-Harvester-Fishpot (MO054)

Description: Deep, nearly level to gently sloping moderately well-drained to very poorly-drained loamy and clayey bottomland soils on floodplains that are occasionally flooded.

Soil Association: Sikeston-Gideon-Sharkey

Corresponding STATSGO Soil Association(s):

Foley-Jackport-Crowley (MO047)
Gideon-Sharkey-Sikeston (MO036)
Scoto-Clana-Malden (MO041)

Description: Deep, nearly level, poorly-drained, loamy and clayey bottomland soils.

Soil Association: Sharkey

Corresponding STATSGO Soil Association(s):

Commerce-Sharkey-Fluvaquents (MO040)
Sharkey-Steele-Tunica (MO037)

Description: Deep, nearly level, poorly-drained clayey soils in slack water positions.

Soil Association: Hartville-Ashton-Cedarcap-Nolin

Corresponding STATSGO Soil Association(s):

Amagon-Dundee-Sharkey (MO038)
Loring-Poynor-Weingarten (MO059)
Midco-Secesh-Viration (MO101)

Description: Deep, nearly level to gently sloping, somewhat poorly-drained to somewhat excessively-drained loamy bottomland soils.

Soil Association: Calhoun-Convent-Falaya

Corresponding STATSGO Soil Association(s):

Amagon-Dundee-Sharkey (MO038)
Falaya-Adler-Zachery (MO046)
Menfro-Winfield-Haymond (MO055)

Description: Deep, nearly level, poorly-drained and somewhat poorly-drained loamy and clayey soils on floodplains, levees and low terraces.

Soil Association: Canalou-Lilbourn-Dundee

Corresponding STATSGO Soil Association(s):

Amagon-Dundee-Sharkey (MO038)

Lilbourn-Wardell-Dundee (MO043)

Description: Deep, nearly level to gently sloping, moderately well-drained to somewhat poorly-drained loamy soils on low natural levees.

Soil Association: Caruthersville-Commerce-Hayti

Corresponding STATSGO Soil Association(s):

Commerce-Sharkey-Fluvaquents (MO040)

Menfro-Clarksville-Haymond (MO056)

Description: Deep, nearly level to gently sloping, moderately well-drained to poorly-drained, loamy soils on floodplains.

Soil Association: Scotco-Malden

Corresponding STATSGO Soil Association(s):

Scotco-Clana-Malden (MO041)

Description: Deep, nearly level to moderately sloping, excessively-drained, loamy and sandy soils on floodplains.

Soil Association: Broseley-Dubbs-Bosket

Corresponding STATSGO Soil Association(s):

Bosket-Malden-Broseley (MO042)

Description: Deep, nearly level to moderately sloping, well-drained to excessively-drained, loamy and sandy bottomland soils.

Soil Association: Broseley-Lilbourn-Wardell

Corresponding STATSGO Soil Association(s):

Lilbourn-Wardell-Dundee (MO043)

Description: Deep, nearly level to strongly sloping, poorly-drained to somewhat excessively-drained, loamy and sandy bottomland soils.

Soil Association: Malden-Dubbs-Gideon

Corresponding STATSGO Soil Association(s):

Scotco-Clana-Malden (MO044)

Description: Deep, nearly level, excessively-drained to poorly-drained, loamy and sandy bottomland soils.

Soil Association: Memphis-Loring

Corresponding STATSGO Soil Association(s):

Memphis-Loring-Falaya (MO045)

Description: Deep, nearly level to steep, moderately well-drained and well-drained, loamy upland soils.

Soil Association: Calhoun-Amagon

Corresponding STATSGO Soil Association(s):

Foley-Jackport-Crowley (MO047)

Description: Deep, nearly level to gently sloping, poorly-drained loamy soils on slightly concave stream terraces.

Soil Association: Crowley-Calhoun-Foley

Corresponding STATSGO Soil Association(s):

Dundee-Sharkey-Bosket (MO048)

Description: Deep, nearly level to gently sloping, somewhat poorly-drained bottomland soils.

WISCONSIN SOILS

Soil Association: Streambottom and Major Wetland Soils

Corresponding STATSGO Soil Association(s):

Abscota-Glendora-Kalmarville (WI061)
Billett-Curran-Ettrick (WI057)
Comfrey-Shiloh (WI038)
Dickinson-Dakota-Billett (WI087)
Dorchester-Chaseburg-Colo (WI044)
Houghton-Adrian-Granby (WI090)
La Farge-Urne-Norden (WI097)
McPaul-Radford-Zumbro (WI037)
Menahga-Meehan-Friendship (WI048)
Rosholt-Chetek-Menahga (WI046)
Seaton-Gale-Tell (WI050)
Seaton-LaCrescent-Lawson (WI112)
Sparta-Gotham-Plainfield (WI095)
Stony and Rocky Land-Seaton-Boone (WI052)
Stony and Rocky Land-Valton-Fayette (WI104)

Description: Soils occur in depressions and drainageways.

Soil Association: Prairie, Sandy Soils

Corresponding STATSGO Soil Association(s):

Sparta-Gotham-Plainfield (WI095)

Description: Region is dominated by dark, deep, sandy soils or soils formed in 20-40 inches of loamy materials over sand. Lighter colored, deep sandy soils also present.

Soil Association: Forested, Sandy Soils

Corresponding STATSGO Soil Association(s):

Boone-Tarr-Impact (WI096)

Description: Soils of the glacial Lake Wisconsin are primarily formed in deep sands. Moderately deep loamy or sandy materials overlie limy till on uplands.

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APPENDIX B
SOIL ASSOCIATIONS OF THE
LOWER MISSOURI RIVER BASIN

APPENDIX B

SOIL ASSOCIATIONS OF THE LOWER MISSOURI RIVER BASIN

This appendix shows state soil associations with their corresponding STATSGO soil association. This was accomplished by visually relating state soils associations, provided as maps by each state, with the STATSGO computer based information. The soil types in each state were searched by reaches on STATSGO and matched with state soil association maps. This appendix provides the various soil types referenced by state with the corresponding STATSGO soil associations and identification numbers.

Two potential areas of error were involved in this process. First, the accuracy and scale of maps provided by each state made relations between the two sources difficult to determine. In addition, it was difficult to correlate from one source to the other. In general, the STATSGO data was based on smaller areas than the states. Therefore, each state soil association overlapped with several STATSGO associations. The STATSGO associations also occurred within more than one state association. The state soils associations and the corresponding STATSGO associations are listed below, with the state descriptions. STATSGO does not provide descriptions in their data.

IOWA SOILS

Soil Association: Colo-Zook-Nodaway

Corresponding STATSGO Soil Association(s):

Coland-Wadena-Havelock (IA119)
Colo-Calco-Kennebec (IA098)
Colo-Nodaway-Zook (IA057)
Dorchester-Chaseburg-Colo (IA010)
Downs-Fayette-Chaseburg (IA002)
Fayette-Nordness-Rock Outcrop (IA005)
Fayette-Rozetta-Eleroy (IA009)
Fruitfield-Elrick-Toolesboro (IA130)
Gara-Armstrong-Pershing (IA041)
Ida-Hamburg-Napier (IA072)
Kennebec-McPaul-Nodaway (IA083)
Kennebec-McPaul-Nodaway (IA088)
Ladoga-Gara-Armstrong (IA053)
Ladoga-Givin-Hedrick (IA032)
Luton-Salix-Keg (IA085)
Marna-Guckeen-Kilkenny (IA116)
Marshall-Exira-Shelby (IA064)
Marshall-Nevin-Minden (IA062)
Monona-Ida-Napier (IA070)
Nodaway-Colo-Zook (IA063)
Nodaway-Lawson-Colo (IA044)
Otley-Adair-Ladoga (IA031)
Sharpsburg-Shelby-Colo (IA051)
Sparta-Dickinson-Chelsea (IA124)
Tama-Killduff-Colo (IA022)
Titus-Wabash-Rowley (IA132)

Description: Nearly level and gently sloping (0-5%) prairie-derived soils developed from alluvium. Soils on steep adjacent upland slopes are included in some areas.

Soil Association: Wadena-Talcot-Ridgeport

Corresponding STATSGO Soil Association(s):

Clarion-Nicolett-Webster (IA110)
Coland-Storden-Hayden (IA119)
Hayden-Lester-Storden (IA115)
Marna-Guckeen-Kilkenny (IA116)
Wadena-Harcot-Biscay (IA099)

Description: Nearly level and gently sloping (0-5%) prairie-derived upland and terrace soils developed from alluvium.

Soil Association: Ida-Napier-Monona

Corresponding STATSGO Soil Association(s):

Monona-Ida-Napier (IA070)
Monona-Ida-Napier (IA074)

Description: Gently sloping to moderately steep (2-18%) prairie-derived soils developed from loess or loess-derived sediments.

Soil Association: Ida-Napier-Castana-Hamburg-Monona

Corresponding STATSGO Soil Association(s):

Monona-Ida-Napier (IA070)

Monona-Ida-Napier (IA074)

Description: Gently sloping to very steep (2-40%+) prairie-derived soils developed from loess or loess-derived sediments.

Soil Association: Luton-Blencoe-Keg-Salix

Corresponding STATSGO Soil Association(s):

Ida-Hamburg-Napier (IA072)

Kennebec-McPaul-Nodaway (IA088)

Luton-Salix-Keg (IA080)

Luton-Salix-Keg (IA085)

Description: Level and nearly level (0-2%) soils developed from alluvium.

Soil Association: Albaton-Haynie-Onawa

Corresponding STATSGO Soil Association(s):

Albaton-Onawa-Haynie (IA081)

Albaton-Onawa-Haynie (IA086)

Description: Nearly level (0-2%) soils developed from alluvium.

Soil Association: Fluvents-Sarpy

Corresponding STATSGO Soil Association(s):

Albaton-Onawa-Haynie (IA081)

Albaton-Onawa-Haynie (IA086)

Galva-Ida-Radford (IA092)

Description: Nearly level and gently sloping (0-5%) soils developed from alluvium.

Soil Association: Clarion-Webster-Canisteo-Nicollet

Corresponding STATSGO Soil Association(s):

Bolan-Ocheydan-Dickman (IA094)

Clarion-Nicollet-Webster (IA110)

Coland-Wadena-Havelock (IA118)

Description: Nearly level to moderately sloping (0-9%) prairie-derived soils developed from Wisconsin till on the Cary Lobe.

Soil Association: Clarion-Canisteo-Nicollet-Webster-Storden

Corresponding STATSGO Soil Association(s):

Clarion-Storden-Nicollet (IA114)

Colo-Calco-Kennebec (IA098)

Everly-Wilmonton-Letri (IA097)

Description: Nearly level to strongly sloping (0-14%) prairie-derived soils developed from Wisconsin till on the Cary Lobe.

Soil Association: Marshall

Corresponding STATSGO Soil Association(s):

Monona-Marshall-Judson (IA075)

Description: Gently to strongly sloping (2-14%) prairie-derived soils developed from loess.

Soil Association: Monona-Marshall-Ida

Corresponding STATSGO Soil Association(s):

Monona-Marshall-Judson (IA075)

Description: Gently to strongly sloping (2-14%) prairie-derived soils developed from loess.

Soil Association: Galva-Primghar-Marcus-Sac

Corresponding STATSGO Soil Association(s):

Galva-Primghar-Sac (IA091)

Primghar-Marcus-Galva (IA090)

Description: Nearly level to moderately sloping (0-9%) prairie-derived soils developed from loess or loess over Wisconsin or pre-Wisconsin till.

Soil Association: Steinauer-Shelby

Corresponding STATSGO Soil Association(s):

Everly-Wilmonton-Letri (IA097)

Marna-Guckeen-Kilkenny (IA116)

Sac-Galva-Primghar (IA095)

Steinauer-Storden-Galva (IA093)

Description: Moderately to very steep (14-40%) prairie-derived soils developed from pre-Wisconsin till.

KANSAS SOILS

Soil Association: Monona

Corresponding STATSGO Soil Association(s):

Hamburg-Monona-Haynie (KS102)

Ida-Monona-Napier (KS012)

Monana-Marshall-Hamburg (KS101)

Wabash-Reading-Kennebec (KS194)

Description: Deep loess hills - Moderately sloping or moderately steep, silty soils on uplands.

Soil Association: Onawa-Haynie

Corresponding STATSGO Soil Association(s):

Haynie-Leta-Waldrone (KS192)

Knox-Higginsville-Sibley (KS113)

Knox-Morrill-Armster (KS110)

Description: Terrace and floodplains - Nearly level, clayey and silty soils on floodplains.

Soil Association: Knox-Armster

Corresponding STATSGO Soil Association(s):

Sharpsburg-Shelby-Armster (KS111)

Description: Deep loess hills - Moderately sloping and steep, silty and loamy soils on uplands.

Soil Association: Eudora-Muir

Corresponding STATSGO Soil Association(s):

Chase-Wabash-Kennebec (KS391)

Clime-Sogn-Martin (KS330)

Eudora-Haynie-Muir (KS333)

Eudora-Kimo-Sarpy (KS193)

Florence-Labette-Tully (KS331)

Gymer-Morrill-Sharpsburg (KS131)

Haynie-Leta-Waldrone (KS192)

Knox-Higginsville-Sibley (KS113)

Martin-Grundy-Elmont (KS120)

Pawnee-Wymore-Kennebec (KS344)

Vinland-Martin-Osaka (KS142)

Wabash-Reading-Kennebec (KS194)

Warrego-Elmont-Kennebec (KS316)

Description: Terrace and floodplains - Nearly level, silty soils on floodplains.

Soil Association: Sharpsburg-Shelby

Corresponding STATSGO Soil Association(s):

Gosport-Sogn-Ladoga (KS116)

Welda-Kamie-Armster (KS122)

Description: Deep loess hills- Gently sloping to moderately steep, silty and loamy soils on uplands.

Soil Association: Martin-Vinland

Corresponding STATSGO Soil Association(s):

Elmont-Martin-Vinland (KS121)

Vinland-Martin-Oska (KS142)

Welda-Kamie-Armster (KS122)

Description: Deep loess hills - Moderately sloping to steep, silty soils on uplands.

Soil Association: Martin-Pawnee

Corresponding STATSGO Soil Association(s):

Martin-Ladysmith-Labette (KS141)

Martin-Wamego-Elmont (KS335)

Pawnee-Martin-Sogn (KS132)

Description: Loess and till hills - Gently sloping or moderately sloping, silty and loamy soils on uplands.

Soil Association: Grundy-Pawnee

Corresponding STATSGO Soil Association(s):

Bates-Woodson-Summit (KS165)

Sharpsburg-Macksburg-Clarinda (KS146)

Woodson-Pawnee-Morrill (KS145)

Description: Loess and till hills - Nearly level to moderately sloping, silty and loamy soils on uplands.

Soil Association: Tully-Pawnee

Corresponding STATSGO Soil Association(s):

Benfield-Clime-Tully (KS315)

Irwin-Ladysmith-Labette (KS349)

Morrill-Ortello-Thurman (KS317)

Description: Loess and till hills - Gently sloping or moderately sloping, silty or loamy soils on uplands.

Soil Association: Clime-Sogn

Corresponding STATSGO Soil Association(s):

Clime-Sogn-Martin (KS330)

Kipson-Crete-Pawnee (KS373)

Reading-Ivan-Chase (KS361)

Smolan-Geary-Kennebec (KS368)

Description: Flint hills - Nearly level to steep, silty soils on uplands.

MISSOURI SOILS

Soil Association: Haynie-Leta-Waldron

Corresponding STATSGO Soil Association(s):

Albaton-Onawa-Haynie (MO035)
Carlow-Dockery-Fatima (MO020)
Dockery-Zook-Blackoar (MO092)
Haynie-Leta-Waldron (MO001)
Haynie-Waldron-Blake (MO065)
Knox-Higginsville-Sibley (MO008)
Luton-Salix-Keg (MO002)
Monona-Ida-Napier (MO005)
Monona-Joy-Winterset (MO017)

Description: Deep, nearly level to gently sloping, well-drained to somewhat poorly-drained, loamy and clayey bottomland soils on floodplain of the Missouri River.

Soil Association: Menfro-Winfield-Lindley

Corresponding STATSGO Soil Association(s):

Menfro-Winfield-Weller (MO021)
Haymond-Dockery-Moniteau (MO028)

Description: Deep, gently sloping to steep, well-drained and moderately-drained, loamy upland soils.

Soil Association: Haynie-Blake-Booker

Corresponding STATSGO Soil Association(s):

Albaton-Onawa-Haynie (MO035)
Haymond-Dockery-Moniteau (MO028)
Haynie-Waldron-Blake (MO065)
Lomax-Blase-Booker (MO026)
Luton-Salix-Keg (MO002)
Menfro-Winfield-Haymond (MO055)
Menfro-Winfield-Weller (MO021)
Urban Land-Harvester-Fishpot (MO054)

Description: Deep, nearly level to gently sloping moderately well-drained to very poorly-drained loamy and clayey bottomland soils on floodplains that are occasionally flooded.

Soil Association: Knox-Judson-McPaul

Corresponding STATSGO Soil Association(s):

Kennebec-McPaul-Nodaway (MO003)
Knox-Higginsville-Sibley (MO008)
Luton-Salix-Keg (MO002)
Marshall-Exira-Shelby (MO006)
Nodaway-Colo-Zook (MO034)

Description: Deep, nearly level to very steep, well-drained and moderately well-drained, loamy upland soils and nearly level loamy bottomland soils.

Soil Association: Buckney-Norborne-Leta-Booker

Corresponding STATSGO Soil Association(s):

Bremer-Cotter-Booker (MO015)

Haynie-Leta-Waldron (MO001)

Description: Deep, nearly level to gently sloping, well-drained to very poorly-drained, loamy and clayey bottomland soils.

Soil Association: Sharpsburg-Higginsville-Lamoni-Shelby

Corresponding STATSGO Soil Association(s):

Grundy-Lagonda-Lamoni (MO012)

Knox-Higginsville-Sibley (MO008)

Sharpsburg-Macksburg-Higginsville (MO010)

Description: Deep, gently sloping to steep, moderately well-drained to somewhat poorly-drained loamy and clayey upland soils.

Soil Association: Kennebec-Zook-Blackoar

Corresponding STATSGO Soil Association(s):

Armster-Snead-Ladoga (MO014)

Nodaway-Colo-Zook (MO034)

Description: Deep, nearly level to gently sloping, moderately well-drained to poorly-drained, loamy and clayey bottomland soils subject to flooding.

Soil Association: Chariton-Bremer

Corresponding STATSGO Soil Association(s):

Carlow-Dockery-Fatima (MO020)

Description: Deep, nearly level, poorly-drained, loamy bottomland soils on terraces of large streams.

Soil Association: Sharpsburg-Polo-Sogn-Snead

Corresponding STATSGO Soil Association(s):

Sampsel-Polo-Snead (MO080)

Description: Deep, moderately deep and shallow, gently sloping to moderately steep, moderately well drained to excessively drained, loamy and clayey upland soils.

Soil Association: Knox-Marshall-Kennebec

Corresponding STATSGO Soil Association(s):

Dockery-Zook-Blackoar (MO092)

Macksburg-Marshall-Grundy (MO082)

Description: Deep, moderately deep and shallow, gently sloping to moderately steep, moderately well-drained to excessively-drained, loamy and clayey upland soils.

Soil Association: Arbela-Piopolis-Blackoar

Corresponding STATSGO Soil Association(s):

Carlow-Dockery-Fatima (MO020)

Description: Deep, nearly level, poorly-drained and somewhat poorly-drained, loamy soils on lower floodplains of streams.

Soil Association: Weller-Goss-Gasconade

Corresponding STATSGO Soil Association(s):

Bardley-Gasconade-Cedargap (MO025)

Description: Deep to shallow, gently sloping to very steep, moderately well-drained to excessively-drained, loamy, clayey or cherty, upland soils.

Soil Association: Menfro-Winfield

Corresponding STATSGO Soil Association(s):

Haymond-Wilbur-Freeburg (MO058)

Pershing-Greenton-Dockery (MO096)

Description: Deep, gently sloping to steep, well-drained and moderately well-drained, loamy upland soils.

Soil Association: Union-Goss-Gasconade-Peridge

Corresponding STATSGO Soil Association(s):

Dockery-Zook-Blackoar (MO092)

Goss-Pembroke-Union (MO060)

Description: Deep and shallow, nearly level to very steep, moderately well-drained to excessively-drained, loamy and clayey upland soils.

Soil Association: Kennebec-Nodaway-Colo-Zook

Corresponding STATSGO Soil Association(s):

Carlow-Dockery-Fatima (MO020)

Colo-Nodaway-Zook (MO004)

Description: Deep, nearly level to gently sloping, moderately well-drained to poorly-drained, loamy and clayey soils on natural levees and floodplains of narrow rivers.

Soil Association: Seymour-Lagonda

Corresponding STATSGO Soil Association(s):

Greenton-Gosport-Snead (MO016)

Lamoni-Shelby-Adair (MO009)

Description: Deep, gently sloping to moderately steep somewhat poorly-drained upland soils with clayey subsoils.

Soil Association: Grundy-Lagonda

Corresponding STATSGO Soil Association(s):

Nodaway-Lawson-Colo (MO024)

Nodaway-Colo-Zook (MO034)

Description: Deep, gently sloping to moderately steep somewhat poorly-drained, loamy and clayey upland soils.

Soil Association: Lamoni-Shelby-Zook

Corresponding STATSGO Soil Association(s):

Gara-Armstrong-Pershing (MO013)

Description: Deep, gently sloping to steep, well-drained to somewhat poorly-drained, loamy and clayey upland soils and deep, poorly-drained, silty and clayey bottomland soils.

Soil Association: Lagonda-Lamoni-Armster-Snead

Corresponding STATSGO Soil Association(s):

Greenton-Gosport-Snead (MO016)

Description: Deep, gently sloping to moderately steep, moderately well-drained to somewhat poorly-drained, loamy and clayey upland soils.

NEBRASKA SOILS

Soil Association: Albaton-Haynie-Sarpy

Corresponding STATSGO Soil Association(s):

Albaton-Onawa-Haynie (NE001)

Albaton-Onawa-Haynie (NE163)

Blyburg-Blencoe-Luton (NE007)

Ida-Monona-Napier (NE061)

Inavale-Cass-Barney (NE018)

Luton-Forney-Solomon (NE082)

Monona-Ida-Judson (NE088)

Redstoe-Gavins-Loretto (NE108)

Sarpy-Onawa-Haynie (NE112)

Description: Deep, nearly level, poorly to excessively-drained, clayey, silty and sandy soils formed in alluvium on bottomlands.

Soil Association: Shell-Muir-Hobbs

Corresponding STATSGO Soil Association(s):

Aowa-Alcester-Kennebec (NE003)

Zook-Leshara-Wann (NE145)

Description: Deep, nearly level, well-drained, silty soils formed in alluvium and loess on bottomlands and stream terraces.

Soil Association: Crofton-Alcester-Nora

Corresponding STATSGO Soil Association(s):

Crofton-Alcester-Nora (NE029)

Description: Very deep, gently sloping to very steep, well to excessively-drained, silty soils on footslopes and uplands.

Soil Association: Monona-Ida

Corresponding STATSGO Soil Association(s):

Coly-Uly-Hobbs (NE023)
Hord-Hall-Hobbs (NE058)
Ida-Monona-Napier (NE061)
Kennebec-Wabash-Zook (NE072)
Monona-Ida-Judson (NE088)
Pawnee-Burchard-Wymore (NE105)
Steinauer-Pawnee-Burchard (NE118)

Description: Deep to very deep, strongly sloping to very steep, well to excessively-drained soils on uplands.

Soil Association: Labu-Bristow-Sansarc

Corresponding STATSGO Soil Association(s):

Labu-Sansarc-Boyd (NE076)

Description: Shallow to moderately deep, gently sloping to very steep, well-drained, clayey soils formed in weathered shale on uplands.

Soil Association: Marshall-Ponca

Corresponding STATSGO Soil Association(s):

Kennebec-Wabash-Zook (NE072)
Marshall-Ponca-Judson (NE083)

Description: Very deep, nearly level to steep, well and somewhat excessively-drained, silty soils on uplands.

Soil Association: Kipson-Sogn-Wymore

Corresponding STATSGO Soil Association(s):

Sharpsburg-Pawnee-Judson (NE113)

Description: Shallow to very deep, nearly level to steep, well and somewhat excessively-drained, silty and loamy soils formed in weathered shale and limestone and in loess on uplands.

Soil Association: Gibbon-Gothenburg-Platte

Corresponding STATSGO Soil Association(s):

Alda-Platte-Leshara (NE107)
Ida-Monona-Napier (NE061)
Inavale-Cass-Barney (NE018)

Description: Shallow over sand and gravel to deep, nearly level, poorly-drained, sandy and silty soils formed in alluvium on bottomlands.

Soil Association: Coly-Uly

Corresponding STATSGO Soil Association(s):

Alda-Platte-Leshara (NE107)
Gothenburg-Platte-Lex (NE041)
Hord-Cozad-Hobbs (NE025)

Description: Very deep, strongly sloping to very steep, well to excessively-drained, silty soils on uplands.

Soil Association: Valentine-Thurman

Corresponding STATSGO Soil Association(s):

Els-Valentine-Ipage (NE032)

Keneshaw-Hersh-Coly (NE071)

Valentine-Thurman-Doger (NE141)

Description: Deep, nearly level to moderately steep, somewhat excessively to excessively-drained, sandy soils formed in eolian sands on uplands.

Soil Association: Gibbon-Wann

Corresponding STATSGO Soil Association(s):

Gayville-Wood River-Silver Creek (NE035)

Wann-Gibbon-Leshara (NE039)

Description: Deep, nearly level, somewhat poorly-drained, loamy and silty soils formed in alluvium on bottomlands.

Soil Association: Gibbon-Zook

Corresponding STATSGO Soil Association(s):

Gibbon-Luton-Saltine (NE038)

O'Neill-Brockburg-Hord (NE100)

Description: Deep, nearly level, somewhat poorly to poorly-drained, silty and clayey soils formed in alluvium on bottomlands.

Soil Association: Hord-Cozad-Boel

Corresponding STATSGO Soil Association(s):

Hersh-Valentin-Holdredge (NE048)

Hord-Hall-Wood River (NE060)

Inavale-Boel-Loup (NE062)

O'Neill-Brocksburg-Hord (NE100)

Uly-Coly-Holdredge (NE126)

Description: Deep, nearly level to gently sloping, somewhat poorly to well-drained, silty and sandy soils formed in loess and alluvium on stream terraces and bottomlands.

Soil Association: Hobbs-Hord

Corresponding STATSGO Soil Association(s):

Hobbs-Hord-Hall (NE049)

Description: Deep, nearly level to gently sloping, well-drained, silty soils formed in alluvium and loess on stream terraces and bottomlands.

Soil Association: Nora-Moody

Corresponding STATSGO Soil Association(s):

Moody-Nora-Judson (NE090)

Description: Very deep, nearly level to moderately steep, well-drained, silty soils formed in loess on uplands.

Soil Association: Moody-Fillmore

Corresponding STATSGO Soil Association(s):

Moody-Fillmore-Nora (NE091)

Description: Very deep, nearly level to gently sloping, poorly to well-drained, silty soils with clayey subsoils in depressions and on high terraces.

Soil Association: Nora-Crofton-Moody

Corresponding STATSGO Soil Association(s):

Nora-Crofton-Moody (NE094)

Description: Very deep, gently sloping to steep, well and somewhat excessively-drained, silty soils on uplands.

Soil Association: Cozad-Hord

Corresponding STATSGO Soil Association(s):

Blyburg-Blencoe-Luton (NE007)

Simeon-Meadin-Valentin (NE116)

Description: Deep, nearly level to gently sloping, well-drained, silty soils formed in loess and alluvium on stream terraces and foot slopes.

Soil Association: Sharpsburg

Corresponding STATSGO Soil Association(s):

Sharpsburg-Fillmore-Butler (NE114)

Sharpsburg-Pawnee-Judson (NE113)

Description: Very deep, nearly level to strongly sloping, moderately well-drained, silty soils on uplands.

Soil Association: Kennebec-Nodaway-Zook

Corresponding STATSGO Soil Association(s):

Kennebec-Wabash-Zook (NE072)

Marshall-Ponca-Judson (NE083)

Pawnee-Burchard-Wymore (NE105)

Description: Deep, nearly level, poorly to moderately well-drained, silty soils formed in alluvium on bottomlands.

Soil Association: Wymore-Pawnee-Burchard

Corresponding STATSGO Soil Association(s):

Pawnee-Burchard-Wymore (NE105)

Wymore-Mayberry-Pawnee (NE144)

Description: Very deep, nearly level to moderately steep, moderately well- to well-drained, silty and loamy soils with clayey subsoils on uplands.

SOUTH DAKOTA SOILS

Soil Association: Clarno-Etuan

Corresponding STATSGO Soil Association(s):

Carthage-Hand-Clarno (SD124)

Clarno-Ethan-Bonilla (SD088)

Clarno-Prosper-Tetonka (SD241)

Forestburg-Shue-Davison (SD123)

Hand-Clarno-Ethan (SD097)

Houdek-Dudley-Stickney (SD118)

Description: Warm dry plain - Rolling loamy soils.

Soil Association: Enet-Delmont

Corresponding STATSGO Soil Association(s):

Blendon-Henkin-Hand (SD091)

Description: Warm dry plain - Level to undulating loamy terrace soils, moderately deep and deep over gravel.

Soil Association: Lamo

Corresponding STATSGO Soil Association(s):

Clarno-Ethan-Lamo (SD095)

Clarno-Lamo-Davis (SD113)

Description: Warm dry plain - Alluvial soils, clayey.

Soil Association: Blendon

Corresponding STATSGO Soil Association(s):

Forestburg-Shue-Davison (SD123)

Description: Warm dry plain - Nearly level to rolling sandy loams to fine sands.

Soil Association: Lamo

Corresponding STATSGO Soil Association(s):

Egan-Wentworth-Worthing (SD102)

Description: Warm moist prairie - Alluvial soils, clayey.

Soil Association: Dempster

Corresponding STATSGO Soil Association(s):

Crofton-Moody-Alcester (SD105)

Description: Warm moist prairie - Nearly level silt loams and loams with sandy and gravelly substrata.

Soil Association: Etuan-Clarno-Betts

Corresponding STATSGO Soil Association(s):

Bon-Ethan-Davis (SD083)

Clarno-Bonilla-Tetonka (SD087)

Clarno-Prosper-Stickney (SD090)

Egan-Wentworth-Ethan (SD096)

Ethan-Clarno-Betts (SD086)

Hand-Clarno-Ethan (SD097)

Description: Warm dry plain - Rolling loamy soils.

Soil Association: Albaton-Haynie

Corresponding STATSGO Soil Association(s):

Baltic-Chancellor-Luton (SD099)

Clarno-Ethan-Lamo (SD095)

Clarno-Bonilla-Tetonka (SD087)

Haynie-Forney-Sarpy (SD100)

Haynie-Grable-Albaton (SD084)

Kennebec-McPaul-Nodaway (SD108)

Modale-Onawa-Blencoe (SD109)

Description: Warm moist prairie - Alluvial soils, silty and loamy.

Soil Association: Haynie-Sarpy

Corresponding STATSGO Soil Association(s):

Albaton-Onawa-Haynie (SD261)

Haynie-Forney-Sarpy (SD100)

Haynie-Grable-Albaton (SD084)

Modale-Onawa-Blencoe (SD109)

Description: Warm moist prairie - Alluvial soils, loamy and sandy.

Soil Association: Ethan-Clarno-Betts

Corresponding STATSGO Soil Association(s):

Ethan-Clarno-Betts (SD086)

Description: Warm moist prairie - Gently sloping to rolling silty soils.

Soil Association: Luton

Corresponding STATSGO Soil Association(s):

Albaton-Onawa-Haynie (SD261)

Baltic-Chancellor-Luton (SD099)

Luton-Forney-Lakeport (SD107)

Kennebec-McPaul-Nodaway (SD108)

Description: Warm moist prairie - Alluvial soils, clayey.

Soil Association: Jerauld-Fedora

Corresponding STATSGO Soil Association(s):

Carthage-Hand-Clarno (SD124)

Description: Warm dry plain - Nearly level to gently undulating claypan soils.

Soil Association: Lamoure

Corresponding STATSGO Soil Association(s):

Lamoure-Ludden-Lowe (SD125)

Ludden-Lamoure-Ladelle (SD139)

Ludden-Ryan-Ladelle (SD152)

Description: Cool moist prairie - Alluvial soils, clayey.

Soil Association: Embden-Hecla-Ulen

Corresponding STATSGO Soil Association(s):

Gardena-Eckman-Glyndon (SD144)

Description: Cool moist prairie - Gently undulating sandy loams and loamy sands.

Soil Association: Beotia-Great Bend-Harmony

Corresponding STATSGO Soil Association(s):

Bearden-Great Bend-Overly (SD145)

Description: Cool moist prairie - Gently undulating to rolling silty and loamy soils.

Soil Association: Harmony-Aberdeen-Exline

Corresponding STATSGO Soil Association(s):

Aberdeen-Harmony-Beotia (SD146)

Description: Cool moist prairie - Nearly level claypan soils.

Soil Association: Aberdeen-Harmony

Corresponding STATSGO Soil Association(s):

Aberdeen-Harmony-Beotia (SD146)

Description: Cool moist prairie - Nearly level claypan soils.

Soil Association: Aberdeen-Exline

Corresponding STATSGO Soil Association(s):

Aberdeen-Nahon-Exline (SD147)

Description: Cool moist prairie - Nearly level claypan soils.

Soil Association: Houdek-Prosper

Corresponding STATSGO Soil Association(s):

Beadle-Dudley-Bon (SD153)

Carthage-Enet-Blendon (SD157)

Carthage-Forestburg-Shue (SD158)

Clarno-Prosper-Tetonka (SD241)

Egan-Wentworth-Ethan (SD096)

Houdek-Prosper-Tetonka (SD155)

Description: Warm dry plain - Nearly level to rolling silt loam to clay loam soils.

Soil Association: Beadle

Corresponding STATSGO Soil Association(s):

Beadle-Dudley-Bon (SD153)

Description: Warm dry plain - Nearly level to rolling silt loam to clay loam soils.

Soil Association: Blendon-Enet

Corresponding STATSGO Soil Association(s):

Carthage-Forestburg-Shue (SD158)

Clarno-Ethan-Prosper (SD240)

Hand-Bonilla-Dudley (SD159)

Houdek-Prosper-Tetonka (SD155)

Description: Warm dry plain - Nearly level to rolling sandy loams to fine sands.

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LIST OF ACRONYMS

DNR	-	Department of Natural Resources
EPA	-	U.S. Environmental Protection Agency
ERI	-	Environmental Resource Inventory
FWMA	-	Fish and Wildlife Management Area
GIS	-	Geographic Information System
MRA	-	Mississippi River State Fish and Wildlife Area
MTNWR	-	Mark Twain National Wildlife Refuge
MVNWR	-	Minnesota Valley National Wildlife Refuge
NGPC	-	Nebraska Game and Parks Commission
NHI	-	Natural Heritage Inventory
NPS	-	National Park Service
NWI	-	National Wetland Inventory
RM	-	river mile
SAST	-	Scientific Assessment and Strategy Team
SCS	-	Soil Conservation Service
STATSGO	-	State Soil Geographic Data Base
SWMA	-	State Wildlife Management Area
UMRWNFR	-	Upper Mississippi River National Wildlife and Fish Refuge
USCOE	-	U.S. Army Corps of Engineers
USFWS	-	U.S. Fish and Wildlife Service
USG	-	U.S. Geological Survey
WMA	-	Wildlife Management Area